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**"DO COLLABORATION AND CUSTOMIZATION REALLY AFFECT**  
**GROWTH IN KIBS? AN EMPIRICAL STUDY IN THE VENETO**  
**REGION"**

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## **Executive Summary**

Knowledge intensive business services are an important element of the knowledge economy, thanks to their specialized knowledge content, they develop innovative service solutions aimed to solve a specific client problem. In the past years, researchers and policy makers have put increasing attention towards KIBS because the number of these firms is increasing, they contribute to employment and represent a valid support for many manufacturing and industrial firms. The growth of the sectors reflects the demand for knowledge inputs from clients that have to deal with the changing environmental: legal, technological, administrative and social conditions.

There is not one standard definition of KIBS, because the sector is characterized by a certain degree of diversity among firms regarding their knowledge content and, such diverse and complex forms of knowledge has led scholars to study how KIBS acquire and use knowledge. Knowledge, tacit and codified, is the primary input of the production process and it is exchanged between KIBS and their clients. Service firms are co-producer of innovative solutions, indeed they make use of external knowledge provided by clients. Given this collaborative relation, part of the literature emphasizes the customized nature of the services, but some contributions showed that KIBS offer also standard and modular services.

KIBS are considered as service providers that support and influence the innovation process inside client's firm, but whether or not they are purely innovators is debated. Innovation theories have been developed mainly with focus on manufacturing firms; more recently, researchers underlined the differences between manufacturing and services, they tried to develop a model to conceptualize innovation that avoid the distinction between goods and services.

The approach assumed here is theoretical and empirical. In the theoretical part, the work will discuss what are KIBS, the dynamics in client-supplier interaction and their mode of innovation, the empirical part presents a regression model on a sample of KIBS firms from the Veneto Region. The thesis aims to understand how KIBS features, customization and collaboration, influence the impact of innovation over firm' growth. I expected that KIBS were significantly engaged in providing customized services, instead the division between customized, standardized, personalized and modularized services vary among group of firms. The findings show that too much emphasis on collaboration with clients and service customization are detrimental for the growth in sales. Only companies that balance service

adaptation and replication achieve higher performances. The literature recognized that collaboration with client foster the development of radical innovations to exploit first mover advantages; instead, it seems that KIBS in the sample decided “to follow” early entrance companies and developed incremental or improvement innovations.

In particular, the thesis is structured as follow: chapter 1 presents KIBS, their role in the modern economy and how they work; chapter 2 analyses the co-production relation with clients, because it has several implications on innovation and growth, and the choice between customized and standardized services; chapter 3 will try to sum up some basic fundamentals on innovation in services and after it will go more deeply into KIBS innovation process, understanding the implications behind the adoption of specific types of innovations and their effects on firm’s growth; chapter 4 presents a multiple linear regression model to test how KIBS features affect growth; finally, chapter 5 discuss the results of the analysis and provides theoretical and managerial implications.



# CHAPTER 1

## Understanding what are KIBS and their role

Knowledge intensive business services are co-producers of innovative and customized service solution for their clients. There are various types of KIBS depending on their role and their knowledge content, the literature has not developed a generally accepted standard definition of KIBS. Going through the definitions provided by researchers, the chapter will try to identify the core elements that characterize KIBS, showing that there are more formal than substantial differences. KIBS have a key role in the modern economy, either because they contribute to employment, or because they represent a valid support for many manufacturing and industrial firms, that need to extend the number of relations with external actors to increase their innovating capabilities. A conceptual model is proposed to understand how KIBS work and how they implement the service solution from the idea generation to the service delivery.

### 1.1. KIBS nature

Many studies consider KIBS as a separate and homogenous group, different from product base manufacturing firms but also from other general service firms, so researchers are interested in understanding how KIBS are different. KIBS provide advanced services to other firms in different phases of the value chain, they are private companies that rely on professional and technical knowledge related to a specific discipline in order to supply a knowledge base service (den Hertog, 2000), their primary value added activities consist of the accumulation, creation, or dissemination of knowledge for the purpose of developing customize services (Bettencourt, Ostrom, Brown, Roundtree, 2002).

KIBS develop, combine and apply various type of knowledge to client specific problems, they provide knowledge to other organisations and help them to deal with the changing environment, new technologies and social conditions (Miles, 2005). KIBS are business to business service providers where the service is the combination of internal and external knowledge, owned by the firm itself and by the client (Landry, Amara, Doloreux, 2012). By definition, KIBS are involved in a continuous knowledge transfer, in particular with their clients, they provide knowledge-intensive inputs to other organizations, both privates and publics, with effects on their process or products, rather than providing a specific artefact. KIBS are enterprises which are characterized by the ability to receive information from

outside and to transform it into services for their customers, thanks to specialized internal knowledge. According with the definitions of KIBS given by the literature, we can derive three core elements (Muller & Doloreux, 2009):

- “Business services” are demanded by firms and public organisation, but they are not produced for private consumptions;
- “Knowledge intensive” can be interpreted in terms of labour qualification or it could be referred to the transaction between service provider and user;
- “Knowledge intensive firms” is related to firms that undertake complex operations of intellectual nature, where human capital is the dominant factor.

Services are demanded by both private and public organizations, each of them need to have access to external services in order to better perform its core activities, so business services are not delivered for private consumption but they are functional for a business activity. These services are characterized to be knowledge intensive, in the sense that they need very specialized knowledge and higher labour qualification; knowledge intensity is not easy to measure, a common indicator is the “share of graduates” employed, this number is generally high in KIBS (Miles, 2005). The transaction, between service provider and client, involves the transfer of knowledge that often cannot be identified in a tangible output. Once a good is produced, it assumes a tangible and physical aspect that is easily identifiable by the producer and the customers; instead, a service is intangible and it does not have a physical exteriority, the production and consumption phases cannot be separated but they occur simultaneously, therefore services cannot be stored in stock and they are the results of a set of procedures (Gallouj & Weinstein, 1997). KIBS are knowledge intensive firms, because they have very high content of knowledge, the human capital becomes the dominant factor which allows them to undertake complex operations of intellectual nature. Knowledge is an essential asset, it is the primary input and it is more important for KIBS than for other firms, it is embodied in people working in KIBS but it has to be integrated with that embodied also in client firms.

KIBS combine knowledge about (Miles, 1995):

- particular domains, that is related to the sector in which they operate, this is the knowledge base linked to KIBS core business;
- particular applications of technical knowledge accumulated in past experiences, it is proper of technology intensive services;
- clients, this is knowledge supplied during the co-production relation.

KIBS are firms involved in consultancy, design, software development, accountancy, professional or more technical services, there is not a generally accepted standard approach to define KIBS because the services they provide are heterogeneous, the relation they establish with other sectors could vary and assume different levels of collaboration, KIBS show different orientations towards innovation according to their knowledge base. A precise classification scheme for the KIBS sector is not available, but some scholars derived a scheme for statistical analysis on KIBS in order to describe their activities as detailed as possible: they recognized inside NACE Rev.2 the sections that include KIBS activities. Some scholars follow the NACE classification even if this scheme does not include some operational and administrative services that are less knowledge intensive, from the other side some “creative industries” that fit in the KIBS definition are not included in the division. Based on Eurostat’s tables, the following classification is proposed (Schnabl & Zenker, 2013).

Table 1. Classification of KIBS activities in NACE 2

| <b>KIBS classification<br/>NACE Rev. 2</b> | <b>Description of section</b>                     | <b>Description of division</b>   |
|--|---|--|
| Section J, division 62                     | Information and communication                     | Computer programming, consultancy and related activities                 |
| Section J, division 63                     | Information and communication                     | Information service activities   |
| Section M, division 69                     | Professional, scientific and technical activities |  |
| Section M, division 70                     | Information and communication                     | Activities of head office; management consultancy activities             |
| Section M, division 71                     | Professional, scientific and technical activities | Architectural and engineering activities; technical testing and analysis |
| Section M, division 72                     | Professional, scientific and technical activities | Scientific research and development                                      |
| Section M, division 73                     | Professional, scientific and technical activities | Advertising and marketing research                                       |

Source: Schnabl & Zenker, 2013

The NACE classification has been revised during the years, a comparison among the latest two versions (NACE Rev.1 and NACE Rev.2) shows that new KIBS has been now included; from one side this confirms the evolution, the growth and the increasing specialization of the

sector, from the other side this shows the increasing diversification and heterogeneity across KIBS. The revised version did not change the previous classification, but it introduced new concepts and details to include new forms of production and new industries (Schnabl & Zenker, 2013). As matter of fact, some scholars, and also this work, refuse to use a general comprehensive classification that encompass the whole sector.

KIBS rely on specialized knowledge as primary input, but this varies across firms. Miles (1995) suggested to classify KIBS in traditional professional services (P-KIBS) and new technology based services (T-KIBS), of which Table 2 gives an overview. The sector includes a wide range of activities from legal, administrative and accounting services, to research and development services, advertising and marketing among others; what link these services is that they have high content of value added and knowledge to support the production process in client firms.

Table 2. T-KIBS and P-KIBS

|   |  |
|---|--|
| <p><b>P-KIBS:</b> traditional professional services, liable to be intensive users of new technology</p> | <p>Marketing/advertising<br/>           Training (other than in new technologies)<br/>           Design (other than that involving new technologies)<br/>           Some financial services (e.g. securities and stock-market-related activities)<br/>           Office services (other than those involving new office equipment, and excluding 'physical' services like cleaning)<br/>           Building services (e.g. architecture, surveying, construction engineering)<br/>           Management consultancy (other than that involving new technology)<br/>           Accounting and book-keeping<br/>           Legal services<br/>           Environmental services (not involving new technology, e.g. environmental law, and not based on old technology, e.g. elementary waste disposal services)</p> |
| <p><b>T-KIBS:</b> new technology-based KIBS</p>   | <p>Computer networks/telematics<br/>           Some telecommunications (especially new business services)<br/>           Software<br/>           Other computer-related services, e.g. facilities management<br/>           Training in new technologies<br/>           Design involving new technologies<br/>           Office services involving new office equipment<br/>           Building services (centrally involving new IT equipment such as building energy management systems)<br/>           Management consultancy involving new technology<br/>           Technical engineering<br/>           Environmental services involving new technology<br/>           R&amp;D consultancy and high-tech boutiques</p>   |

Source: Miles *et al.*, 1995

Traditional professional services (P-KIBS), like accountancy, legal, consultancy, design and building services, help customers to comply with complex systems providing knowledge about administrative rules, regulation and social groups (in the case of market researches), technical contents in the case of architecture and building services. They have larger shares of employees graduated in humanities and social sciences. Traditional professional services are typically users of technologies rather than developers. New technology-based KIBS (T-KIBS) like software developers, computer-related services and other services involving new technologies, tend to have larger shares of sciences and engineering. (Miles et al., 1995).

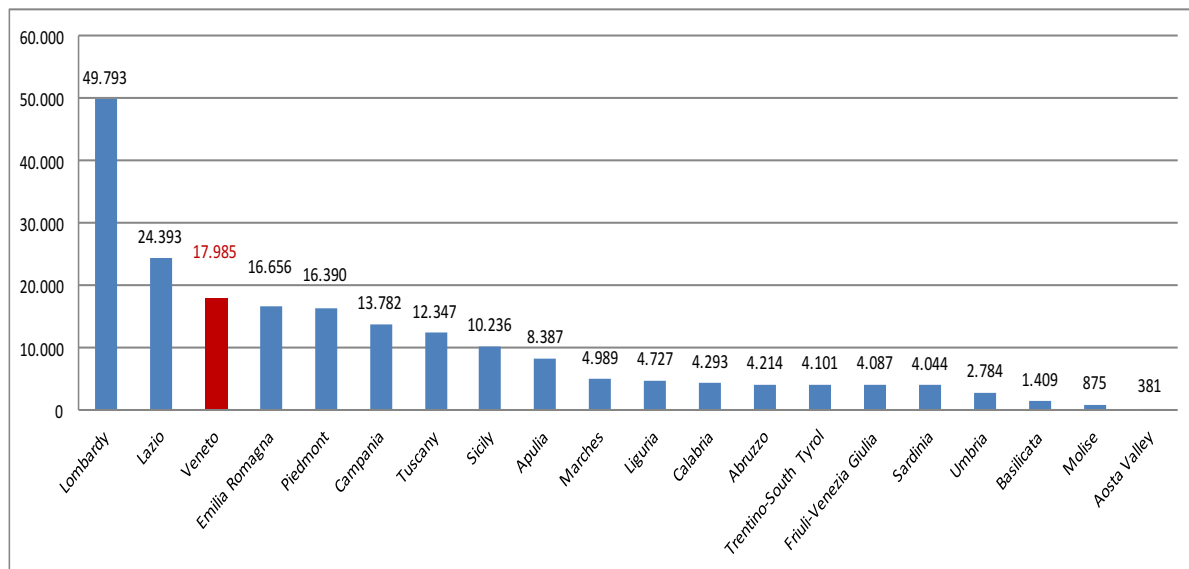
Miles's classification received support from other studies on KIBS that show how the sector is expanding across countries, through different specializations (Muller & Zenker, 2001; Freel, 2006). Consoli and Elche-Hortelano (2010) critically addressed those flows of the literature that consider KIBS as a homogeneous group, they investigated the knowledge base of American KIBS and observed that there is a high variety across KIBS regarding their skill requirements (Consoli & Elche-Hortelano, 2010). In practices, in the overall KIBS sector, firms share some similarities, knowledge intensity, the process of accumulation, creation and dissemination of knowledge (what is called in this work "innovation value chain"), but there are also elements that push scholars to create sub-categorizations, generally according to their knowledge content.

Even if there are some sub-sectors corresponding to services and showing similar features with KIBS (high qualified labour and the use of new technologies), they are not considered KIBS, for example: health care related services, retail and wholesale, social welfare services, hospitality, tourism, entertainment.

## **1.2. KIBS' role in the contemporary economy**

In 2016 there were almost 205.873 thousands of active KIBS (an active company is inscribed in the Register of Companies, it carries out the activity and does not have concurrent procedures in place) in Italy, of which 17.985 in Veneto, the third region after Lombardy (49.793) and Lazio (24.393). This data have been extracted from *Movimprese*, the quarterly statistical analysis on Italian enterprises run by *InfoCamere* on behalf of *Unionecamere*, based on the archives of all Italian Chambers of Commerce, KIBS are selected according with the classification ATECO 2007, which corresponds to the above mentioned NACE Rev.2 classification.

Figure 1. Active KIBS in 2016



Source: Movimprese

KIBS firms play a crucial role in the regional system, because they create opportunities for innovation, contributing to the local development of the region. KIBS are strategic partners for manufacturing and industrial firms with whom they can leverage the innovation process, in terms of new technologies and market opportunities, they represent a valid support because they are able to influence the innovation process, providing expert managers, tailor made software, advices, technical or professional services: they constitute an important part of the business environment and allowed companies to survive from the crisis making their business model more flexible.

KIBS are a defining elements of innovation-oriented regions, high-income and high-technology systems, their role seems to be relevant in developed regions, where increasing competition requires firms to innovate and to provide differentiated product, therefore manufacturing and industrial firms need specialized suppliers and qualified human capital to foster the innovation process (Corrocher & Cusmano, 2014).

For various reasons many firms have started to contract out services that originally were internal activities (Miles, 2005). Companies, in particular manufacturing and industrial, pay attention towards innovation because it is a key driver of performances, but in recent years, firms needed to rationalize their internal cost structure and to make their business model more flexible. Thus the increasing competition in the markets and the recent financial crisis made innovation more complex for SMEs and they started to collaborate with external partners combining external and internal resources. Firms have started to outsource some activities,

many manufacturing and industrial companies decided to concentrate upon their core activities and capabilities and to combine them with external source of knowledge. Industrial and manufacturing companies are living in a competitive and dynamic environment, to challenge the day to day issues they need to adapt their business to the changing context and thus they require much more flexibility to operate; many companies cannot develop internally new innovations because they may lack financial resources or the knowledge and the competences needed, not all the activities can be performed internally but some of them are acquired externally from specialized companies. KIBS clients can make their organization more flexible and they can rely on more specialized service providers.

The sector is growing also to balance the increasing demand for certain forms of knowledge (Miles, 2005). A growing number of organizations introduced new technologies and softwares and thus they require the appropriate knowledge in order to make effective use of that; even if some of them have developed internal IT capabilities, many firms need a specialized technology services provider. Some IT service providers are involved in the development of new softwares, web pages or in the configuration of complex technologies required by clients (system integrator), some other providers are born to help clients to deal with different technological problems. Our economy is becoming dependent on technological applications, following this trend, many firms will need always more specialized consultants and providers, as the request for technological-knowledge increase, also the KIBS sector will increase strengthening its importance in the knowledge economy (Powell & Snellman, 2004).

Also factors associated with internationalisation and globalisation of business influenced the dynamics inside the sector, off-shoring trends could reduce the number of KIBS established locally (in Europe or in Italy) and new information technology solutions can make it easier because they facilitate communication over long distances. Firms operating at international level require specialized knowledge about the environments; dealing with environmental issues is one of the major challenge for companies, in particular for multinational companies: many KIBS help their clients to comply with regulatory requirements, they provide legal, accountancy and administrative services, there is also a growing demand for specialised social knowledge to understand customers and market trends.

Specialization is becoming a features of modern business environment, knowledge is spread everywhere under different forms and for various reasons companies could have difficulties to acquire specialized competences, thus we need some actors that function as knowledge collectors. The growth of the sector reflects new organizational choices for

manufacturing and industrial firms, policy makers should see KIBS as driving force of innovation in all the value chain.

The attention toward the service sector is increasing, service companies, in particular knowledge intensive companies, play a relevant role for the development of the economic system because they help other companies to growth. The relevance of the sector, the evolution of the tertiary sector and outsourcing trends imply a redistribution of knowledge in favour of KIBS, in particular in advance regions, where manufacturing's competitiveness depends on knowledge inputs (Corrocher & Cusmano, 2014). The service sector is becoming a source of new knowledge and it is gaining importance thanks to its contributions in terms of employment, indeed in many advance economies it accounts for the highest number of jobs and value added, this compensated in part the number of jobs losses in manufacturing (Evangelista & Savona, 2003).

Service companies contribute to the local development, regional growth and innovation are some questions to answer for policy makers, intangible factors are becoming a sources of competitive advantages both at regional and individual firm level, in this view the focus on agents that own, convert and diffuse knowledge is increasing and knowledge based sectors are growing. Firms own very specific competences in well-defined fields, employment is growing in the service sectors and service firms are those that invested more in the last years, they require high skilled people, which are the key of the long term economic growth, the knowledge economy requires structures in which people and knowledge intensive firms play the role of knowledge intermediaries. The labour market for services offers attractive opportunities for knowledge workers, working in KIBS can be lucrative and other companies could not be able to offer such high wage; on the other hand, many people want to diversify their carrier because they also offer possibilities for learning and diversified job experiences. KIBS intervene in all the phases of the value chain and they contribute to the client companies' competitiveness, promoting their innovative capacity and giving them technical and managerial support. KIBS have an important role in the innovation system because not only they develop internal knowledge, but also they stimulate other firms to innovate (Corrocher & Cusmano, 2014) and they show a considerable potential support to economic development, they do not only transmit knowledge but they also re-engineer knowledge. KIBS firms have a sort of leverage effect over company performances, and ultimately over the regional development, because they stimulate innovation in other companies.



### **1.3. How KIBS operate: collectors of knowledge**

One important role for KIBS is to provide a point of fusion between more general scientific and technological information dispersed in the economy, and the more local requirements and problems of their clients, thus KIBS are defined as bridges for innovation (den Hertog, 2000; Muller & Zenker, 2001): they either acquire knowledge from manufacturing companies, either they are providers of knowledge and innovation for manufacturing companies, they are partners of manufacturing because KIBS services are complementary to manufacturing industry's products. Data, information and knowledge have an intangible nature, they are gathered, produced and provided principally by service companies, in particular, knowledge intensive services are responsible for combining knowledge from different source and for re-distributing it. In this sense KIBS are defined as collector of knowledge, because they have the role to be in the middle between client's knowledge and the wider knowledge base economy. KIBS act as intermediaries between the entire set of codified and tacit knowledge and their clients' knowledge, they are "catalysts in the innovation systems" because they have the function to gather the knowledge spread in the world and to make it available to realize new innovation, this process transforms information and knowledge into customize service solutions for specific client problems (Castaldi, Faber, Kishna, 2013; Muller & Doloreux, 2009).

KIBS are problem solvers that aim to solve a specific customer problem by producing and delivering a service, which is the combination of KIBS and client's knowledge (Pina & Tether, 2016), they apply their competences in order to gather and process knowledge spread in the environment, then they combine it with their internal knowledge to solve clients' problem.

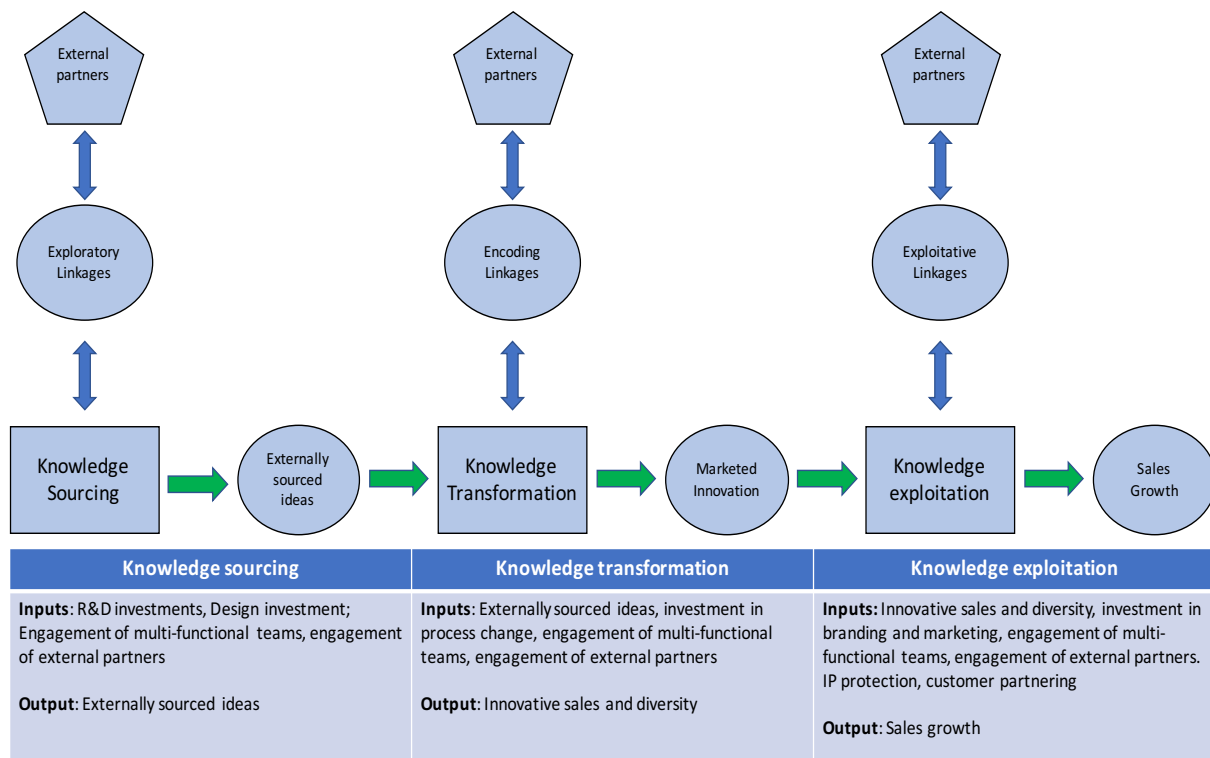
There are many sorts of knowledge, knowledge about the services itself, the subjects it addresses, the business process and problem, knowledge about the service production, project management, business relationships and work organization. Thus, the knowledge owned by different types of KIBS varies. As consequence, the way in which this knowledge is gathered and processed for their clients take different forms (Miles, 2012). KIBS are specialized service providers that deal with specific business problem not affordable by their clients, so they do not need to know everything or a little about everything, but they have a deep insight about a few things.

They are different from product-base manufacturing and operational services firms also because they are characterized by continues interaction with clients. KIBS firms have high

collaborative relationships with their clients on the model of client – supplier relationship, because most of the knowledge they need to successfully generate a service solution is in the hands of the clients (Bettencourt et al., 2002; Miozzo, Desyllas, Lee, Miles, 2016). KIBS and clients are co-producers of customize service developed for a specific client’s need, they are also highly innovative and facilitate innovations in other economic sectors. KIBS co-innovate with their clients through continuous interactions, they are a sources of innovation for other companies because they are able to influence the innovation process of other firms in different sectors thanks to their knowledge base, innovative KIBS not only develop internally their own knowledge, but they also externally stimulate the production of knowledge among their clients, in particular among manufacturing firms, the strategic role of KIBS is to adapt the generic knowledge spread in the economy to specific customer needs.

The process through which KIBS gather, innovate, exploit and commercialise knowledge to growth their business, is defined in the literature as “innovation value chain” (IVC) and, as showed in Figure 2, it comprises three stages (Love, Roper, Bryson, 2011): knowledge sourcing, knowledge transformation and knowledge exploitation.

Figure 2. The innovation value chain: structure and key indicators



Source: Love et al., 2011

In the first stage, firms put effort to gather the necessary knowledge spread among different sources, they perform exploration activities to pursuit knowledge, which is the combination of internal and external information; exploration activities allow to seek new revenues generating opportunities thanks to new products and services, but these kind of activities are highly uncertain regarding the final output. Knowledge gathered could be about technology, market structure, business model or new ideas, it can be from internal or external sources, in particular, companies should be aware on how external sources influence internal capabilities. The access to specific knowledge depends on the external links and relationships: while information about products came mostly from customers, information on new technologies emerge from suppliers or research centres. Empirical findings show that firms with exploratory links with customers have on average more innovative ideas, this suggests that the most innovative firms should implement appropriate mechanisms to identify the most important customers and build solid linkages with them.

KIBS improve their internal capabilities with the goal to develop new products or process and subsequently creating value, therefore the second stage involves the process of transforming knowledge into new services or business process, this is the phase in which the knowledge acquired in the previous phase has to be translated into a new service solution. The effective capacity of the firms to transform knowledge inputs into innovative solutions is influenced by the firm's internal sources and capabilities, KIBS should be always able to combine their internal resources with those of their clients; in this second phase, external relationships are no longer aimed to explore new knowledge, but they aim to transform knowledge into innovative solutions. As suggested from the open innovation literature, when firms extend the number of external links, the probability to develop innovative and successful ideas increases.

In the final stage firms need to exploit the innovation through the commercialization of the service developed, exploitation is referred to the profitable use of the knowledge acquired; knowledge has been already codified into new services or business process solutions, these new innovative output should have in some way a positive effect on company's performances and growth. This is the phase in which the company link the knowledge developed with corporate performances, this link will be stronger depending on the firm ability to exploit and commercialise the innovation; it could happen that a service initially customised and co-produced with clients, then it is transformed into a more standard service for a wider range of customers.

This set of activities, exploration, encoding and exploitation, takes place through different external relationships. External partners are involved in each of the three phases of the innovation value chain, this common point highlights the central role of customers in KIBS.

Miles (2012) distinguishes also between front-office and back-office activities, the former activities are those visible by clients and also performed in cooperation with them, clients face part of the activities and they are more closely engaged in the production process; instead the latter are not visible to the client, they are performed internally and they require less external interactions (Miles, 2012).

#### **1.4. Conclusions**

Researchers' attentions towards the KIBS sector is due to: the growth of the sector, increasing demand for knowledge input, increasing specialization in the labour market, structural changes in the industry, contracted-out services, firms' requirement for technical and professional services, new regulations, environmental challenges. The definitions given by scholars help to understand role, activities and KIBS' features, but the above discussion shows that it is difficult to generalize the entire KIBS sector under the same classification. Even if KIBS share some common features (co-production, customization, knowledge intensive services) they are different according to their knowledge base, indeed two broad categories has been identified: technological and professional KIBS. Each firm has its specialized knowledge to apply during the service production process but in addition, to create and deliver the service solution, KIBS rely on client's knowledge: KIBS source knowledge from their clients, they process and transform knowledge internally, then they deliver the service exploiting the new knowledge created. Since now, it is clear that the relation with clients is essential because they own part of the knowledge that KIBS require to implement the service solution. But this relation has many issues and, if it is not well managed, KIBS will find difficulties to meet customers' needs and to achieve a profitable growth.

## CHAPTER 2

### **Managing the relation between KIBS and their clients**

KIBS do not innovate alone, but they are co-producers of customized services with clients. Theoretical and empirical models emphasised the complex relation between KIBS and their customers, this involves continuous knowledge transfer, communication and client effort to achieve the desired results. However, knowledge exchange could be complicated by several factors, such as the tacit or codified nature of knowledge, client participation and proximity. Well managed relations allow both KIBS and customer to create valuable synergies for their organizations, however client co-production could be hard to manage and thus KIBS should adopt appropriate customer participation enhancing tools. A generally recognised feature is that KIBS offer customized services, as consequence of the co-production relation with customers. When KIBS can replicate their services, they can easily extend their client base, thus they face the challenge to deliver a service that meet specific customer's requirements but, at the same time, that can be adapted to a larger range of customers. This raises the question about how KIBS can balance the trade-off between standardization and customization, ensuring profitability and firm growth?

#### **2.1. The role of clients as co-producers**

A defining feature of KIBS firms is their co-production relation with customers (Bettncourt et al., 2002; Greer & Lei, 2012; den Hertog, 2000; Etgar, 2008), KIBS and their clients are co-producers of innovative service solutions because both provide inputs during the production process of the services. In co-production, consumption activities are not separated from the production process, that is defined as a "chain of sequential bundles of operational activities linked in a network chain" (Achrol and Kotler, 1999, cited in Etgar, 2008); these activities are of different types, from those that involve more intellectual effort to those that involve more technical effort. When KIBS and their clients are able to combine efficiently their activities, they create value for their respective organizations, co-production requires that client participate in one of these activities other than consuming the final output.

In service, collaboration has been for long a key driver of innovation, interactions with external actors could provide benefits to the internal organization, external sources of knowledge stimulate innovation more than the typical learning by doing (Leiponen, 2005), indeed the use of external sources is important in the innovation process especially in services

and in KIBS. In comparison with manufacturing, that are likely to innovate through internal R&D, services are used to collaborate with customers and suppliers, especially when they are particularly oriented towards innovative activities.

KIBS rely on client collaboration to develop innovative services, since they have to satisfy and to solve a specific client's need, they develop customized services through continuous interactions and close cooperation because clients themselves possess some of the knowledge and competences required (Bettencourt et al., 2002; Kuusisto & Riepula, 2009; Miozzo et al., 2016). Differently from other situations, clients will play the role of co-producers in a collaborative working relation, a business-to-business partnership. KIBS and their clients enter into a dialogue, to define the service nature, during which there is a knowledge exchange aimed to contribute to the creation of superior value for both the organizations, so the quality of the resulting service depends on joint effort, collaboration and communication between service provider and client. Firms are recognizing that working with clients, suppliers and other external actors surrounded the company is a way to facilitate innovation, to reduce risk and to gain new insight and knowledge, working with customers increases the probability that also other customers will appreciate the innovation, reducing risk and ignorance about customer's needs. Client's contribute by (Tether 2002):

- providing complementary knowledge, possibly including the users' technical know-how;
- helping to find the right balance between performance and price;
- providing an understanding of users' behaviour;
- enhancing the chances that the innovation will be accepted and adopted by other firms within the same user community; this is particularly significant if the user is respected within its community, and if the supplier is relatively unknown; it is also likely to be particularly important when the innovation is more radical, rather than a minor incremental change.

In addition, after a successful collaboration, customers promote firm's reputation among other customers. Good reputation is always an instrument to increase the customer base, no additional customers will ask your firm any type of advice if you are not well known as having superior skills or abilities and a proven experiences.

Customers could have different roles: resources, co-producers, buyers or users. Customers as resources or co-producer directly or indirectly influence the operations and the outcome of a company, while the other roles, buyers and users, will be less influential on the production

process and the company sees customers as passive receivers of innovative goods and services. In the former cases, customers provide their resources, mostly in form of knowledge, to the production process, they have a direct involvement in the production phases, contributing more deeply to design the product or service. In the latter cases, the company is waiting for feedback from the market or to catch new trends and do not receive any contributions in the production process (Edvardsson, Gustafsson, Kristensson, Witell, 2011).

There are different partnership models used to conceptualize the client-supplier relation, Bettencourt et al. (2002) refer to four model: selling partner management, channel management, co-production management and relationship marketing. Among these, “co-production management” is the one recognized as the one to explain KIBS-client interaction. In *selling partner management* the focus is on salesperson characteristics and behaviours, how much their role is relevant, especially in case of customize and complex service, during the interaction with buyers they have to understand customers’ needs and convince unsophisticated buyers about the service value, the relation is appropriate in dynamic environment, the customer role is simply to explain its needs and do not contribute to achieve a certain outcome. When the focus on customers’ behaviours is limited and formal organization (contracts, control system, division of responsibilities, channel structure) affects performance, *channel management* is appropriate. This is typical of long-term and highly coordinated partnerships (supplier – distributor relationship), where value derives from moving and transforming items (cost reduction) rather than creating knowledge. *Relationship management* is focused on how relational exchanges between organizations are established, developed and maintained, particular attention is given to the role of commitment and trust. This model can be applied to long-term and highly coordinated partnerships like that between supplier and distributor, value derive from aligning goals of partners, not only the structures as in channel management. Finally, *co-production management* is the one identified as the more appropriate to explain the relation between KIBS firms and their clients, the model has similarities and differences with the others. The focus is on how the client behaviours, which support knowledge-creation between parties, can be managed in order to contribute to the partnership, using formal and informal activities. It is appropriate in dynamic context and for complex and customize outcome, for situation in which the client role is strictly integrated with that of the partner for the purpose of creating specialized knowledge, which is a source of value; generally, those are long term relationships, but they can be also of shorter duration or organized in projects.

Table 3 provides a synthesis of the four types of relations, it distinguishes for each category: its focus, when the relation is most appropriate and the level of analysis (Bettencourt et al., 2002).

Reassuring, selling partner management and co-production management are appropriate in complex contests to deliver customize services and are focused on the role of individuals in contributing to the partnership. Relationship marketing and co-production put emphasis on stimulating cooperative attitudes through informal organizational mechanisms (socialization and joint planning for managing successful partnerships), differently from channel management which privileged formal organizations.

As co-producer, KIBS leverage the innovation process inside client firms, indeed the relation between KIBS and their clients goes beyond the simple service delivering and it shift towards a long term-relation. Differently from other partnership types, co-production is focused on the client contribution to the value creation, putting emphasis on the role of individual participants other than the organizational activities, thus the process of knowledge creation and exchange is critical in KIBS. By definition they need knowledge, and so human capital, as primary resource; from one side, employees are expertise that supply services to their clients, they use their individual knowledge about specific industries and apply their know-how to specific situations, their ability enables them to solve problems; on the other side, also customers have a fundamental role in KIBS production process, they have to provide information, feedback and inputs.



Table 3. Types of relations between service provider and client

| Category                          | Focus  | Relationship appropriateness  | Level of analysis  |
|-----------------------------------|--|---|--|
| <b>Selling partner management</b> | <ul style="list-style-type: none"> <li>▪ How <b>salesperson</b> characteristics and behaviours affect customer attitudinal outcomes</li> <li>▪ Focus on front-end relationship and salespeople</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Complex and customized service</li> <li>▪ Unsophisticated buyers</li> <li>▪ Dynamic environment</li> <li>▪ Client role is limited to share information about needs</li> <li>▪ Value derives from salespeople convincing customers</li> </ul>   | <ul style="list-style-type: none"> <li>▪ Individual level (salesperson)</li> <li>▪ Limited attention to understand the role of client contribution in achieving favourable outcomes</li> </ul> |
| <b>Channel management</b>         | <ul style="list-style-type: none"> <li>▪ <b>Formal organizations</b> affect performances: contracts, control system, division of responsibility</li> <li>▪ Limited focus on customer behaviour</li> <li>▪ Coordinating partners action</li> </ul>                                    | <ul style="list-style-type: none"> <li>▪ Long term and highly coordinated relationships</li> <li>▪ Value derives from moving and transforming items, rather than creating knowledge</li> <li>▪ Focus on transaction cost reduction</li> </ul>   | <ul style="list-style-type: none"> <li>▪ Organizational level</li> <li>▪ Limited attention to understanding the role of individual relationships to achieve the outcome</li> </ul>             |
| <b>Co-production management</b>   | <ul style="list-style-type: none"> <li>▪ How the firm can manage the <b>client's contribution</b> and behaviour to achieve profitable outcomes, using formal and informal activities</li> <li>▪ Focus on client's behaviour that support collaborative knowledge creation</li> </ul> | <ul style="list-style-type: none"> <li>▪ Complex and <b>customized service</b></li> <li>▪ Dynamic environment</li> <li>▪ Client role is integrated with that of the partner for the purpose of recombining and creating knowledge, which is the source of value</li> <li>▪ Long term partnerships, often divided in projects</li> </ul> | <ul style="list-style-type: none"> <li>▪ Individual and organizational level</li> </ul>  |
| <b>Relationship marketing</b>     | <ul style="list-style-type: none"> <li>▪ How <b>relational exchange</b> between organizations are established, developed and maintained</li> <li>▪ Focus on the role of commitment and trust</li> <li>▪ Cooperative attitude</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Long term and highly coordinated partnerships (supplier-distributor, wholesaler)</li> <li>▪ Uncertain environment</li> <li>▪ Vale derives from aligning goals of partners</li> </ul>   | <ul style="list-style-type: none"> <li>▪ Organizational level</li> <li>▪ Limited understanding of multi-dimensionality of client contribution</li> </ul>                                       |

Personal adaptation from Bettencourt et al., 2002

KIBS are required to be more proactive in delivering any sort of solution to problems, not only they have to be close to their customers and to learn from them, but they should also develop internally preventive and problem management strategies, *i.e.* the ability to find a

solution to problems even when clients refrain to provide all the necessary information, clients expect that they are aware about the service implementation and how the service itself can support the client's strategies (Toivonen 2004, cited in Miles 2005).

Customer participation is “*the degree to which customers are involved in producing and delivering the services*” (Edvardsson et al., 2011), it is the customer willingness to provide constructive feedback, instruction and inputs to allow the service provider to make decision during the service delivery process. When customers and service providers work closely they share various types of information about industries, customer needs, goals, process and preferences, in this way customers contribute to the service development because the provider will be more informed and he will better design the service. Customers help to solve possible complications and eventually to cover lack of knowledge, they are in the position to evaluate the service quality from a different perspective, they can highlight features that they do not appreciate.

While clients gain new knowledge and solutions, KIBS gain more experience about a specific industries, that can exploit for present and future works, every time they interact with clients operating in new markets and industries, it represents an opportunity to learn and to differentiate the services offered, indeed many clients chose the service provider based on its experience in a specific field (den Hertog, 2000). As consequence of their collaboration with a more extensive client base, KIBS firms can gain economy of scale and increase efficiency and effectiveness because they accumulate experience and learning from different clients.

Hence, KIBS integrated knowledge coming from two different sources, from one side the knowledge base of KIBS is linked to their employees' knowledge, employees are expertise that serve clients and they have gained their knowledge after years of academic studies or on the field experiences, so they have basically a theoretical knowledge, KIBS need high educated employees in order to successfully deliver unique services. From the other side the co-production model considers clients as not only “client” in *stricto sensu*, but also as “employees”, they know everything about their industry, product and organization, in general everything needed to contextualize the problem and as internal human resources they provide their knowledge to the firm. Thus, it is possible to affirm that knowledge embodied in clients affects the success of the collaboration between KIBS and users, when KIBS perceive that their clients are knowledgeable, they find more motivation and satisfaction in collaborating with them, and the client's contribute will be certainly of higher relevance. Of course, customer's knowledge alone is not sufficient if it is not adequately transferred and if clients

refuse to collaborate. In deep analysis show that KIBS's knowledge is not just the sum of internal and external sources, it is not only a matter of transferring knowledge from customers to the service provider but it is also a process performed internally by KIBS that recombine knowledge previously acquired into a new service solution (Muller & Doloreux, 2009).

The literature put strong emphasis on this interdependence, and it is precisely what this work aims to investigate: to what extent collaboration with client affect KIBS growth and how much they should collaborate?

Due the relevant role given to clients, they became a source of competitive advantage for KIBS firms, when both parties excel at performing their roles and relationships are adequately managed, it brings to efficiency and thus KIBS firms extract more value than their competitors: from one side, client must be willing to provide all the information and knowledge requested by the service provider, especially in the early stages of the process, from the other side the service provider must be sufficiently able to integrate its own knowledge with that of the client, in order to understand client's needs and deliver the right solution to the problem. Both parties have to coordinate their actions, in particular when the final output is complex and customized, open and clear communication will favour the development of a service that will fit with client's internal organization and industry structure (Edvardsson, Gustafsson, Kristensson, Witell, 2011). Clients must understand their roles in terms of tasks and behaviours, in particular they must have the knowledge, the skills and the abilities necessary to collaborate with the service provider (Bettencourt et al., 2002). The client's role does not end in the problem identification and in the payment of a price, but it is characterized by a continues knowledge transfer, so he has an active role, rather than a passive one, it means that in case of any problem or difficulties during the service implementation, the client must support the service provider by communicating feedback and proposing additional solutions. The service provider should continually check whether collaboration is moving toward the desired goals monitoring customer's activity in order to ensure that the service will meet the expectations (Bettencourt et al., 2002).

Services dominant logic (SDL) focus on how value is co-created, while goods dominant logic (GDL) suggest to offer goods or services that have value (Edvardsson et al., 2011). In the SDL, communication and interaction are key elements. The two logics have different orientation, SDL is more customers oriented and put customers in the centre, this implies more relationships dynamics and a different way to organize the company internally, KIBS firms will structure their internal organization in order to include customers as active player

and to respond faster to their needs, through their organization KIBS combine specialized internal knowledge with external knowledge to provide the service. In the SDL customer's skills and knowledge are as important as those of the employees, customers provide input and the more they have influence over the production process the more the service quality depends on their knowledge. When customers take over the responsibility of the service innovation process, co-production seems to be an appropriate rewarding strategy and KIBS can reduce the cost for innovating.

This strategy become risky when knowledgeable customers start to develop innovation without the company support, and in the extreme case they start to market and sell innovations by themselves. This happens when, after years of collaboration, customers learn how to perform by themselves the activities that were previously outsourced; in addition, KIBS have not made intense use of formal protection mechanisms for their service, because the nature of the service itself does not allow for an effective use of these instruments.

There are trends that push towards more integration with customers, integrating customers has certain advantages but KIBS should learn how to better manage this relation and they have to understand that co-production is not always guarantee of success (Edvardsson et al., 2011).

The role of client as co-producer is becoming stronger, they are an active part in the service development process, customers' information enter directly into the value creation process, not via simple questionnaires, observations or focus group, but through direct involvement.

KIBS stay close to customers from the early stage of the development process to the after sale phase in order to better assist customers, the rational is to improve their satisfaction and firm performances. Integrating customers inside the development process is a kind of pre-market test where KIBS can understand in advance whether or not the service will be accepted. From one side customer integration reduce the possibility that KIBS do not properly recognize customers' needs, market oriented companies increase the possibility that the new service developed is generally accepted, but from the other side if the co-production relation is not supported by adequate communication channel, the advantages from the integration are lost and the service delivery process become expensive. Indeed, some studies recognize that intense communication with customers is key for the success of new products, instead when information and knowledge exchange is low, firms could not meet customers' requirements. Certainly the knowledge acquired from customers became an intangible asset for KIBS and this represent a competitive advantage.

## 2.2. Knowledge flow between KIBS and their client

KIBS apply their knowledge to customers' problems when they lack the internal resources (financials, humans, technological, among others), but there is not the guarantee that KIBS will possess all the necessary knowledge, for this reason the service provider need to interact with clients. KIBS are considered to be in the centre of a learning network that involves a continuous knowledge flow, they make use of different sources of knowledge, but principally they rely on client' knowledge (Landry at al., 2012).

Knowledge is the primary input, a production factor which combines both KIBS and client's competences and information, knowledge is also the output that derives from the interaction with clients and it is sold to them (Castaldi et al., 2013). This distinguishes KIBS from product-base firms, either for what concern the production phases, either for the nature of the outcome, one is an artefact and one a service, manufacturing firms have a high degree of codified knowledge while KIBS have a higher degree of intangible knowledge. KIBS provide competences that client firms do not develop internally, they are providers of very specialize and relatively intangible knowledge which is aimed to solve specific customer problems (Muller & Doloreux, 2009).

KIBS are a defining elements of the Knowledge Economy, that is based on the production, distribution and use of knowledge and information, they rely more on intellectual capabilities than on physical inputs. Powell and Snellman (2004) define the Knowledge Economy as:

*“production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence”*

Knowledge intensive activities contribute to develop new innovation rapidly, so that products and services reach faster their mature phase in the obsolescence curve. In the Knowledge Economy, innovation is favoured by the knowledge exchange among organizations, the idea that knowledge plays an important role is not new to the economic theories, knowledge incorporated inside humans has been always studied in various field and economists have included it inside their models because it has positive effects over the production function, GDP growth and profitability.

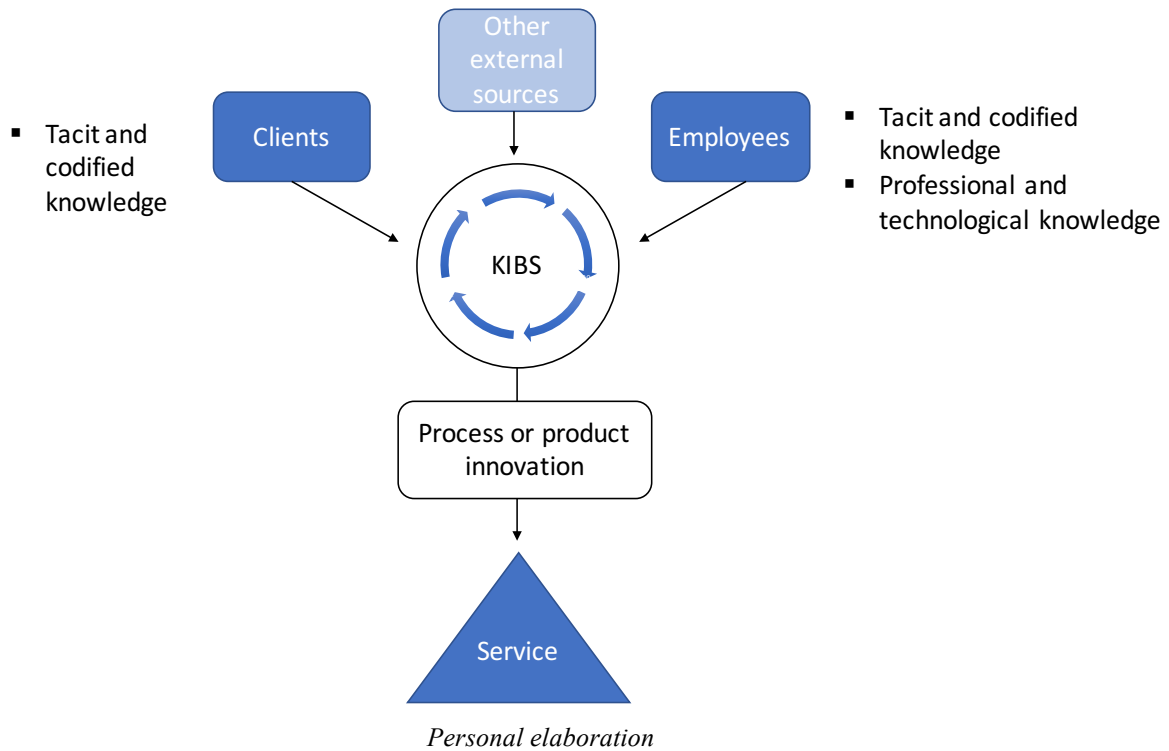
The knowledge-based economy has emphasised services and intangible elements of production and products, clients recognize value also from transactions and not only from the physical goods, this means that companies are putting more attention towards the service design and customer relationships.

The degree of collaboration between KIBS and their clients, certainly depends on how easily knowledge can be exchanged (transported, interpreted and absorbed), and to explain it, the literature recurs to the Nonaka and Takeuchi paradigm (den Hertog, 2000). Other than tangible forms of knowledge, also intangible forms are essential in the client-supplier relation, KIBS combine various type of specialized knowledge, both tacit and codified: while codified knowledge (knowing about, the objective knowledge) is contained in publications, reports and patents, tacit knowledge (know how, the subjective knowledge) is the one embodied in person and context-related content, these characteristics make tacit knowledge more difficult to be exchanged. Knowledge exchange between KIBS and clients might be related sometimes to codified knowledge, sometimes to tacit knowledge or a mix of the two. In addition, they distinguished between individual knowledge, which is embodied in individual employees, and organizational knowledge, which includes either that of the single operator and either procedures and routines existent at corporate level; therefore, the process of knowledge generation is also a combination of individual and organizational knowledge (den Hertog 2000). When KIBS and their clients interact, the various types of knowledge are mixed, linked and exchanged during the interactions, when a new project starts within KIBS, a new team is set up and the members interact with clients exchanging tacit and codified knowledge. The model of knowledge creation provides some relevant findings about the creation of knowledge in KIBS:

- The model emphasises the importance of both tacit and codified knowledge;
- Interactions among individuals, at various level are important, so it supports the importance of the interactions between employees and clients:
- Knowledge creation is a dynamic conversion process that combines tacit and codified knowledge.

Figure 3 is a stylized representation of the knowledge flow between KIBS, their client and other external sources.

Figure 3. KIBS combine knowledge from various sources



As already said, KIBS are collectors of knowledge because they acquire knowledge from different sources, mainly through collaborations with clients but also from other external sources in the environment, even if of minor relevance. Then, they re-engineer and combine external knowledge with that of their internal organization, which is embodied in employees. Knowledge can assume different forms, tacit and codified, and can be of different typologies, professional or technological. The combined knowledge stimulates process or product innovation, that ultimately allows for the service delivering. Many times the literature emphasised how KIBS stimulate innovation in client firms, but here the work wants also to underline the role of KIBS as producers of innovations inside their own organization, and how these are stimulated by the knowledge flow with clients. Thus, the knowledge flow between KIBS and their clients is bi-directional, because KIBS receive information and knowledge from clients, and then they give back the knowledge processed internally in the form of service solutions, more or less innovative. This bi-directional interaction, which involves knowledge and innovation, will be better clarified in the paragraph 3.4. The aim is to remark the contribution of KIBS and client to the service production and to show that the service is the combined output of KIBS and client' knowledge, which assumes different forms.

Knowledge exchange is very important for KIBS (Landry et al., 2012), first because it is embodied in people, not only in employees but also in clients, second because the need for more customized services requires more knowledge exchange between KIBS and clients. Well managed knowledge exchange process is fundamental for the overall performance of the company, KIBS look internally what type of knowledge they miss and they try to acquire it from their clients. Codified and tacit knowledge are used complementary, which means that KIBS cannot rely only on one of the two, but both types are needed. Codified knowledge, by definition is easy to protect via patents and other instruments, this enhances its reuse, while tacit knowledge is more difficult to exchange and to protect, making the reuse more difficult (den Hertog, 2000). This suggests that KIBS' strategy depends on the type of knowledge they exchange with their clients, on the possibility to maximize the benefits coming from codified knowledge, which is reusable and easy to transfer, and on the incentives to protect their tacit knowledge: KIBS will operate where they can better exploit their unique and difficult to imitate resources, *i.e.* their knowledge base.

In this context, information and communication technologies (ICT) play a central role, internet and new technologies allow KIBS to have easy access to customers' knowledge, for example via virtual communities, but most important they facilitate interactions and communication among clients and suppliers, otherwise impossible under some circumstances. But new technologies, other than favouring communication with customers, facilitate also the access to information about market trends and customer's needs, thus KIBS can easily collect feedbacks about new services.

Organizational culture can affect the way in which collaboration with clients influence the innovation process, KIBS should mature the ability to absorb information from outside, the way in which employees integrate internal knowledge with that received from outside depends on their skills.

Relations with customers are very important because from one side they are the final users of the service and so it has to be developed in relation to their needs, from the other side they are a fundamental source of knowledge that could become a critical success factor, and ICT make this relation easier reducing time and local distance between service provider and customers. For example, time is required for interacting with customers during the early phases of the project in which KIBS need to understand the customer's needs and to study how to design the service; in the initial phases a comprehensive study of the customers' problems push KIBS to interact more frequently with them, thus KIBS and their clients cannot expect



that the service will be delivered in very short time. The role of customers can be determinant in positive and negative sense: either if they provide the necessary information, either if they do not provide the necessary information slowing down the entire process.

The knowledge flow intensity between KIBS and their clients can vary according with the type of service to provide, some KIBS firms provide routine activities (taxation, legal, accounting) for which they do not require intense knowledge flow with client because they already own much of the knowledge required to deliver the service, in these cases the same knowledge can be applied repeatedly and the client has a minor role as co-producer. On the opposite, KIBS provide certain services which requires higher understanding of the client's organization, the service involves the combination of KIBS and client knowledge and thus higher knowledge flow intensity.

To ensure continuous communication flows, KIBS should put effort in managing the relation with customers otherwise they will lose profitable opportunities.

### **2.3. Avoiding low client participation**

The relation between KIBS and their clients is associated with the way in which the service is produced and with the degree of client participation in the service co-production (Miles, 2012).

These relations can be considerably different case by case, some can be very remote and KIBS are employed only to perform defined task, others can be more intimates and interactives, these are typical in long term partnerships.

There are reasons to affirm that collaboration with clients can be complex, sometimes customers are not willing to engage in an interactive relationship, so when clients do not understand their role and refuse to cooperate, they impede an efficient service delivery process. Client participation is important in services and it is even more important in KIBS because it increases the effectiveness of the service delivered, which is defined as the extent to which the service represents a solution to customer's needs and whether or not it is delivered in time (Santos & Spring, 2015).

Clients are important but sometimes they do not understand their role in shaping the quality of the service outcome and the functioning of the relation with KIBS, indeed co-production requires KIBS to develop also the ability for managing the relation with clients. Customer participation is an undervalued issue, KIBS firms should seriously consider how to manage the relation with customers because it might ultimately affect their performances and growth.

The service provider has at its disposal some performance-enhancing tools to ensure client participation. First, KIBS could chose to adopt some selective *criteria* to select their customers instead of working with all, being selective allows KIBS to be more accurate in choosing the appropriate clients in order to avoid expensive interactions, some criteria could be: the firm culture or organization, the treatment of business partners, the dedication of client resources to the project. KIBS should be proactive towards client's capabilities, in the sense that, when it is necessary, they should provide training and educational activities. Trust-building and socialization activities allow to jointly plan and explicit the roles. The service process requires to be continually monitored and assessed applying project leaderships and mutual evaluation of performances with the client (Bettencourt et al., 2002). Feedbacks and continuous participation enable both parties to know the service implementation status, in any time it will be possible to perform corrective actions or to adopt alternative solutions during the service developments modifying the original service features according with customer needs, in this way KIBS reduce the possibility to deliver a service which is not accepted by customers, avoid to incur in additional costs to reduce mistakes and to deliver the service in delay.

Many factors affect customer participation and prevent them to be actively involved in the co-production process (Bettencourt et al., 2002). Clients that do not frequently outsource process and activities may not understand what they really need or what they are buying; customers may also lack expertise or clarity about their role; in addition, clients could refrain from participating in the relation because they may lack the internal resources to maintain a close and intensive interaction or because they may have little motivation to participate.

The relation can be made more difficult depending on the spatial proximity between KIBS and their clients, in some cases KIBS are hired by contractors, so there could be an intermediary between KIBS and customers which make the relations more difficult because he reduces direct communication, so delegating responsibilities to contractor can make the collaboration with clients more difficult. KIBS often require direct contact with customers in order to deliver solutions to specific customers' needs and to better exchange knowledge and inputs, even if ICT facilitate communication, also localization does matter. Localization is determined by the proximity with customers, interaction with customers is important and thus KIBS prefer to stay close to their customers because it facilitate communication, control over customers who refrain from collaborate and in general make more efficient the service production process. Proximity with clients favours physical meeting, which are recognized to

be more efficacy than telephone or video meeting, especially for the exchange of tacit knowledge that could requires demonstrations or interactions with clients (Corrocher & Cusmano, 2014; Landry, Amara, Doloreux, 2012). Spatial proximity has different importance in relation to the different phases of product or process innovation: in the case of product innovation, it is more important at the initial stages to perform market analysis and assess the feasibility of new ideas; for process innovation, it has importance to understand problems that could occur in the process or when it is necessary to train human resources. In sum, it appears that proximity is important in the early stages of product innovation, while for process innovation it is important in the early and late stages (Wong & He, 2002). For example, in the case of a consulting activity, the starting phases require more tacit knowledge than codified, so personal contact and physical meeting are necessities, thus proximity helps to manage these phases. Although ICT could reduce the distance in the service production, it seems that physical proximity is important to exchange and share knowledge. Héraud (2000) retains that: *“there is an apparent paradox in the new knowledge-based economy: to a certain extent, the trend of de-materialisation and the development of the techniques of communication should help the creative networks to get rid of distance; but at the same time it appears that complex cognitive processes need not only large flows of codified scientific and technical information, but also a lot of tacit knowledge for using and interfacing that information. Then proximity does matter, since building common tacit knowledge implies close contacts, at least at the beginning”* (Héraud, 2000, cited in Muller & Zenker, 2001).

Knowledge is costly to transfer, in particular tacit knowledge, but intensive communication is seen as determinant for the success of a new services, efficient communication enables KIBS and their clients to exchange knowledge, so companies should put emphasis on communication in order to capture information from customers to better satisfy their needs. Limited interactions with customers reduce the capacity of KIBS firms to provide successful services. Frequent, bi-directional, face to face and active communication allows bilateral trust and high-quality information exchange about customers' needs. *Frequent communication*, referred to the amount of interaction or feedback exchanged between companies and clients. *Bidirectional communication* intended as the extent to which both parties take the initiative and contribute to the end results (the way in which communication is distributed among parties). *Content* is related to whether or not the focus is on customer needs and to possible issues in the value creation process, it leads to increase the

success of the service (Gustafsson, Kristensson, Witell, 2012). Every time a client does not reply to a supplier's request, it is a friction for the supplier that cannot go on in the service implementation, in this sense both the performances are strictly dependent each other: one cannot be successful without the support of the other.

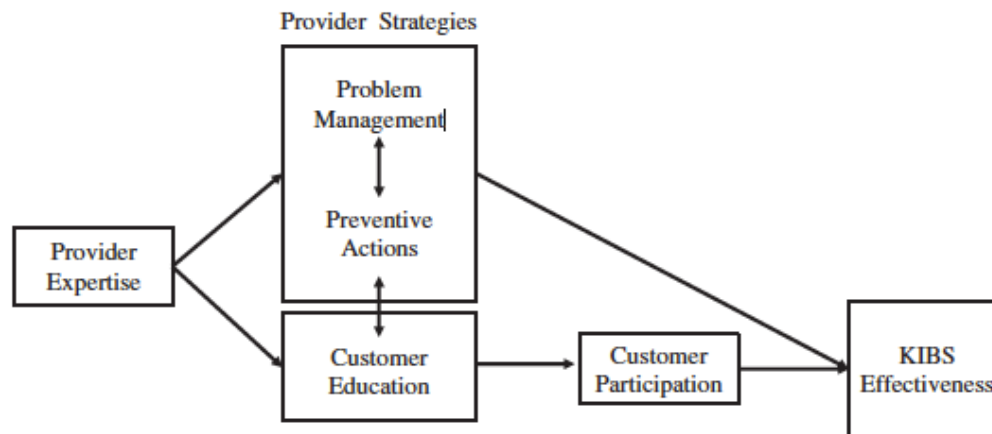
Collaboration among firms has a certain degree of uncertainty about the possibility to obtain information regarding the partner's competencies, but also, and most important, there exist the possibility that the partner could put low effort in the collaborative relations, a type of behaviour associated with moral hazard, indeed the partner could decide, as a free rider, to limit its contribution in the alliance. There is a long literature about incomplete and imperfect contracts, from one side KIBS firms face the dilemma to collaborate for innovation because it can represent a profitable opportunity, but from the other side it is not easy to predict what will be the extent of the client effort. When partners recognize the existence of private benefits, which arise from the collaboration, but they are achieved individually, the risk of opportunistic behaviours increases. Differently, the collaboration should be based on common benefits, that can be exploited by both parties and that result in knowledge creation. When partners build the right collaborative structure, maybe using incentive and rewards, and they learn how to work together, they are able to create value using assets, as knowledge, competences or other resources, that otherwise could not be available without the partner's support (Hipp, 2011).

KIBS management has to deal with these issues and it should find a way to increase customer engagement, so how to avoid the lack of customer participation, and where KIBS can work to increase it?

The relation between KIBS and customers requires continuous incentives to go on and to ensure that both parties put sufficient effort to design the service, financial and non-financial rewards, could be used to incentivize one or the other party. To enable customers to participate, certain conditions should be met and customers should have clear understanding of their role, they have to know the importance of their tasks and their responsibilities. Customers themselves are expertise, because they own knowledge about how the service has to be delivered in order to fit with their requirements, expert customers are more able to communicate their needs and to identify the service's attribute. The service provider can also implement action to enhance customer participation, for example educating them: teaching how to execute tasks, guiding them in their decisions, providing reliable and timing information. KIBS can increase customer participation fostering socialization,

accommodating their needs and requests, putting effort in solving their problems, stimulating their participation. Research findings have shown that, other than customers education, KIBS should implement preventive and problem-management strategies, while the former requires a certain degree of customer interaction, the latter are less dependent on customers and they allow the providers to overcome the lack of customer participation (Santos & Spring, 2015).

Figure 4. Providers' strategies: overcoming limited customer participation to increase KIBS effectiveness



Source: Santos & Spring, 2015

Researchers identified three type of complementary strategies adopted by KIBS to manage situations of low customer participation and to increase the service effectiveness (Santos & Spring, 2015):

- Customer education provide better inputs to the delivery process and therefore may lead to more customer participation. When providers explain basic aspect of the service, customers are more aware of what they are buying and what they should do. Thus customer expertise increases and their role is more clear, they are more able to share information and to collaborate.
- Preventive and problem management action contribute to KIBS effectiveness in case of low quality of customer's inputs: preventive management actions reduce customers dependence, they bypass the lack of input and customer participation; problem management actions refine aspects of the solutions delivered, alleviate the impact of specific changes in customers demand.

These actions are used with different intensity, depending on the situation: while problem management and preventive actions can have direct positive effects on KIBS effectiveness, overcoming the lack of customer participation, customer education has an indirect impact

because it first affects customer participation. The effective of KIBS actions depends more on the ability of manager and provider experts to implement these strategies in order to ensure customer participation, than on customer participation itself. It means that providers' strategies should not focus exclusively on increasing customer participation (quantity) but also to improve the quality of the relation.

Client and supplier are involved in interpersonal relationship and because the business activity is by definition aleatory, thus some difficulties and inconveniences could complicate the service development, a trusted relationship is required to ensure a better collaboration. The concept of trust includes: information exchange, as the expectation that both will provide information; flexibility, in the sense that both are willing to adapt according to the circumstances; solidarity, both put emphasis on the relationship (Heide 1992, cited in Bettencourt et al., 2002). Working with clients with whom exist a long term relationship makes trust stronger, especially in case of radical innovations there is the need to keep it secret for longer time period, indeed the service providers should always adopt measures to ensure that customers will maintain confidentiality regarding the new innovation and they will not license for their own the jointly developed services (Greer & Lei, 2012).

#### **2.4. The effects of supplier user integration on product development**

The integration between suppliers and users is acquiring a central role in the innovation process, because more often users are involved in the co-production process with suppliers (den Hertog, 200). Users are individual customers or firms, that will acquire a product or service from the supplier and expect to enjoy some benefits; on the contrary, suppliers expect to profit from selling the product or services to users. Both want to benefit from innovative product and services.

The integration between users and suppliers provides some advantages: while suppliers can receive additional knowledge, new ideas and can better understand customer needs to adapt their product, users, providing information about the desired product's features, ensure to receive a good or service that meet their needs.

This relation is even important when firms want to innovate their products, because integrating suppliers or customers is a useful way to acquire external resources for new product development (Verona, 1999, cited in Lau, Tang, Yam, 2010). The so-called user-centred innovation process substitutes and provides more advantages in respect to the manufacturer-centric innovation development system, indeed studies on user innovation

showed that many of the most novel products or processes have been developed through interactions with users (von Hippel, 2005). According to the user-centred model, users involved in the innovation process contribute to develop a product that meet their needs, they can develop exactly what they want rather than rely on manufacturers agents. In manufacturer centric models, products are developed only by manufacturers in a close way, user's needs are identified by manufacturers without any interactions. However, users are now involved in the production process and there are reasons to affirm that their involvement in the development of new products will increase, indeed several benefits are recognized from the client involvement. User interaction is also favoured by new technologies that make easier the interaction between suppliers and customers, also in case of long geographic distances, in addition users are improving their technical capabilities, thus they can easily communicate what they want and being involved in the production process.

Users are willing to co-develop because they are looking for something that is not already present in the market or because they want to shape the product characteristics according to their needs. Today customers' needs are heterogeneous, companies that provide totally standardize products or services and do not understand different customers' requirements risk to lose part of the market.

In the case of KIBS firms, this relation seems appropriate, users and customers can be a source of information for service firms and they can stimulate innovation: they provide ideas to improve the service or suggest new radical services. As already mentioned, in KIBS firms there is a direct involvement of users in the co-production process.

This relation does not provide only benefits, because agency costs, for monitoring and for outcomes that do not fit with the user's requirements, may arise when the interests of the two parties are not the same.

Suppliers and users are involved in two main process (Lau et al., 2010): information sharing and product co-development. They share various types of information about technology, marketing, production, among others. The work already showed that without appropriate communication flow KIBS find difficulties to develop the service. The second main process involve the product co-development, that in KIBS assumes a more advance stage, indeed it is namely co-production. Aside from more literals specification of the word, what the work wants to underline is the joint effort that both parties put on the generation of the final outcome. Thus, products can be created employing internal and external resources, company's internal know-how and user's know-how. Because many firms lack internally the

relevant resources to develop innovative products, combining internal and external knowledge the probability to develop innovative products increases. It is argued that product development depends on how the company leverages internal organizational capabilities and resources with other external organizations, suppliers, customers and other institutions (Verona, 1999, cited in Lau et al., 2010).

In many cases lead users are the originators of the radical innovation, they have some problems to solve that cannot be actually satisfied in the market through conventional services, but they have in deep knowledge about their domains, *i.e.* in deep knowledge about their needs. These knowledge is gained after years of experiences and learning and it represent one of the inputs to develop innovative solutions for their problems. But users do not have all the competences and lack resources, financials and humans, thus they look for someone that own the technology and the knowledge to make an idea or a problem a successful radical innovation. Users become co-developers and their involvement can be articulated in several layers (Lettl, Herstatt, Gemuenden, 2006). Initially, their contribution includes the presentation of the problem and the evaluation of possible solutions, a current need motivates users to start a co-operative arrangements and to transfer their knowledge to the service provider. The next stage involves the development of the solution and users' competences in their own domain are required to design and implement the service. Users know-how not only is beneficial to build the architecture of the service but also to provide continuous constructive feedback to the innovation, these will certainly improve the success of the service once on the market. In general, collaboration with skilled and competent users is important for the overall success of the service.

The benefits from this relation are reciprocal, users receive an innovative service to satisfy their needs that otherwise would not be satisfied at all; instead, KIBS firms have the possibility to access new knowledge and competences to deliver successful radical innovations, they can benefit both from the introduction of new products and from the improvement of internal processes. Once the benefits of the integration between suppliers and users have been recognized, also the literature increased the focus on the impact of this relation over new product development and firm performances.

So far everything sounds strategically good, but there are numerous trade-offs involved in this relations, among which: the choice between standard or customized services, the impact of innovation over firm growth and the influence of client contribution over firm growth. The empirical model will investigate some of these.



## 2.5. Service customization and standardization

Business service firms develop new products or process during the co-production relation with clients and other external partners (den Hertog, 2000), in order to exploit these innovations and to realize the sustained investments, the new services have to be commercialised. The co-production process is complex and it requires continuous interactions with customers, clients' needs are transformed internally in customized service solutions combining the acquisition of external knowledge and dedicated team's experience. As consequence of the co-production relation with customers, services are generally tailor-made and companies want to exploit these customized solutions through a process of knowledge commercialization and delivering standardise solutions (Love et al., 2011).

Many firms face the challenge to combine products, goods or services, adaptation to individual customer needs with the possibility to replicate the product for other customers, this is typical in KIBS firms (Cabigiosu et al., 2015). Customization and standardization are discussed both for manufacturing and service firms, because the choice has several implications over customers' satisfaction and firm's growth: the company has to manage contemporarily customer satisfaction, which in services is related to service quality, and service productivity choosing the right balance between customization and standardization. Sundbo (2002) tried to give a definition of both strategies:

*“Standardisation is the situation where the service product is the same every time [...]. Customisation is the situation where the service product is created in the concrete situation as an individual solution to the customer's specific problem”* (Sundbo, 2002; cited in Bettiol, Di Maria, Grandinetti, 2012).

Tether et al. (2001) tried to explain the issues between standardization and customization using the reverse product life cycle model proposed by Barras (1986, 1990), it is necessary to notice that the model has been developed in a period in which studies on innovation shared the idea of service firms as passive adopters of technologies, while today scholars refuse this idea.

According to Barras, in the initial phases of their life cycle, services adopt technologies developed elsewhere and innovation is oriented to improve the service production process's efficiency because outputs are standardized among customers and competitors provide similar services. In the second phase the service provider develops a new production system to improve the service quality, there is a greater variety of services provided on the market and

competition is more on quality than on prices as in the former phase. In the last phase, there are more services produced and firms focus their efforts on product innovations rather than process innovations, this last phase is associated with a higher levels of service customization because the competition is increased and firms tend to differentiate their offer, consequently standardization declines (Barras, 1986, 1990, cited in Tether et al., 2001).

Customized services aim to meet specific customers' needs, thus the final output is completely adapted to their requests, customization is necessary when there is heterogeneity in the market demand and competition among firms, companies in dynamic and changing environments should be able to adapt their offering, because customers' needs are heterogenic, firms chose customization and collaborative innovation with customers to reduce development risks and to increase the probability to meet customers' specific needs (Greer & Lei, 2012; Wang, Wang, Ma, Qiu, 2010). Customization depends on the firm's internal flexibility, defined as its capacity to adapt the internal organization to client specific needs; firms shall evaluate the customer's willingness to pay for the services, because they will propose a price that can allow them to margin over the cost for adapting the business, thus: when the costs of customization are low and customers are willing to pay different prices for different services features, customization can be achieved, on the contrary when cost for customization are high and customers have lower willingness to pay, customization cannot be achieved (Tether, Hipp, Miles, 2001).

Standardization introduces an industrialization logic in services, standard services are undifferentiated and they do not have any customer-specific features, standardization ensures that the company, at least in the long run, develops competences, knowledge and gains efficiency in operations because repetitive actions minimize risks, mistakes and deviation, the entire process is controlled and the service is delivered with minimal time and cost. Standardization arise in price sensitive markets where competition is based on price, firms try to achieve economy of scale, where they try to control cost and where the production process is performed following routines. With standard services customers can easily verify the quality level when firms provide information to enable them to judge the service received; in addition, innovation can be managed internally and firms obtain higher returns on investments (Bettiol et al., 2012).

While customization requires more local proximity with customers, because frequent interactions are needed in order to better adapt the service to specific needs, instead standardization can be achieved also when distances are relatively long.

The range of services offered can go from totally personalized experience to one-size-fits-all, in KIBS the service developed via collaborative relationships with clients are often customized. So the challenge is to develop customer oriented strategies ensuring operational efficiency and growth. Some researchers argue that customization is more important in service firms than for products firms (Wang et al., 2010).

Regarding standardization, its effects may not be satisfactory at all if the company put small effort in pursuing this strategy, standardization requires investments in employee training and most important it follows employees' learning curve, but standardization could require time to achieve the desired results because learning is a slow process. Once a company choose standardization implicitly decide to limit the range of products offered. But when the level of standardization increases, economies of scale are achieved and failure rates decrease.

Customized services intercept customers' specific needs, giving them the possibility to enjoy a unique experience, but it requires more cooperation with clients than standardization because the firm needs to deeply identify specific needs and so firms will invest more in time and human resources, other than learning. Also for customize solutions, when the level of customization is low, the company will not be able to meet customers' needs. Thus, in both customization and standardization, when the level is low this has null or negative impact on performances.

The dilemma is what is the right level, the balance between customization and standardization? These are two different strategies to pursue in order to satisfy clients and they have different implications on the firm's business model because they require different organizational design: standardization is supported by operational efficiency and cost reduction, while customization aims to satisfy several clients in different ways, generating revenues through higher premium paid, it is oriented to customers and markets instead of the internal operations.

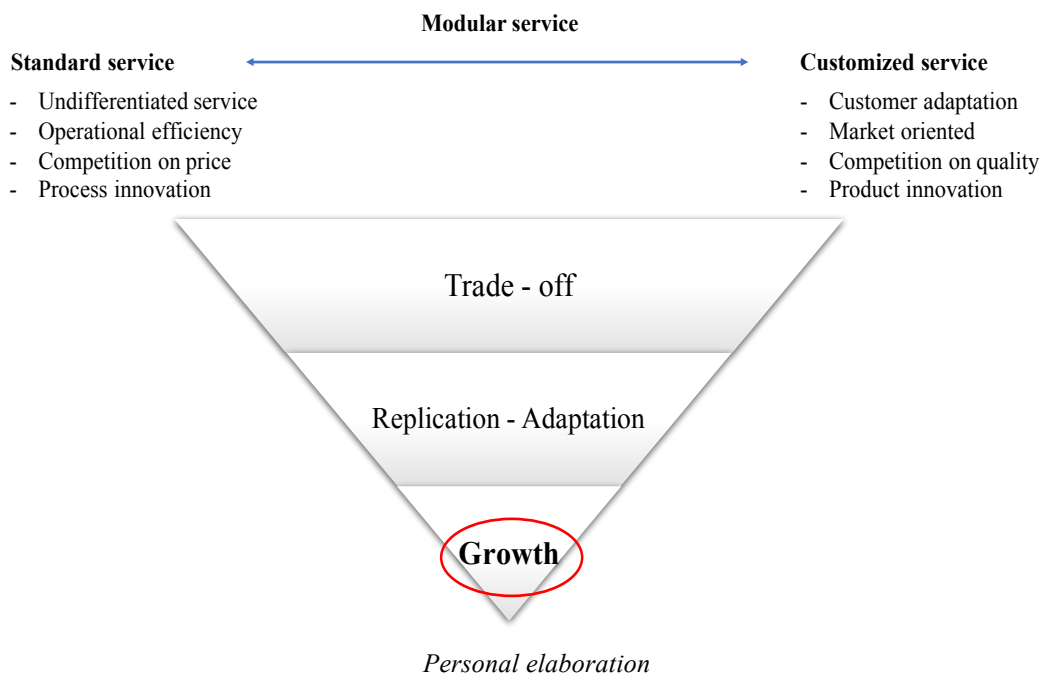
From the literature, it emerges that finding a balance is difficult and a firm cannot standardize and customize simultaneously (Wang et al., 2010). There are different ways in which you can pursuit customization, in some cases customers choose how to personalize the product at the moment of purchase, think about a car that can be bought adding different types of accessories or a PC in which is possible to install different types of software. In other cases, like in KIBS, before the production phases and during the production phase there are continuous interactions between clients and service providers, the client will communicate all the information required to design the service.

In KIBS the output is produced to be used by the final user which is the client itself, who has also significantly influenced the production process and the product design, in our case a service, thus the concept of co-production is linked in a certain sense to product customization (Etgar, 2008). Each customer will differently affect the production process because each of them has different uniqueness that affect the final output, in this sense co-production helps to customize the service because it will be developed in line with the single customer's needs, and differently co-production allows customers to design the service according to their needs and this determines a certain level of customization.

KIBS firms acquire product related knowledge aimed to solve a specific problem, they deliver a customized service which has been developed according to client information and knowledge to meet a specific client's need, finally the customized service is not easily replicable for other customers or even difficult to standardized.

Figure 5 gives a hypothetical representation of the elements that firms should balance when they have to choose between standardization and customization to achieve growth.

Figure 5. Standardization vs customization: how to achieve growth?



KIBS face unique challenges in managing the collaborative relation with clients, either because client's contributions ultimately affect the quality of the service delivered, but also because KIBS seek to replicate the final output. KIBS will try to protect their critical knowledge but when it is created through interactions with clients, it is more difficult. While clients ask for customized solutions that cannot be replicated for others, KIBS try to develop

less customized solutions and more standardized solutions in order to achieve a certain level of replication (Landry et al., 2012).

The level of service customization and standardization can be studied in relation to the firm's innovative activity, we could expect that service (product) innovation is common among firms that tend more to customize the service, while process innovation is more common among firms that tend to standardize their outputs.

Even if it is difficult and often not confirmed empirically, there are some hypotheses that try to explain the difference between firms that innovate and firms that do not. One reason to affirm that when firms standardize their product or process, they innovate less, might be associated to the length of the service life cycle: since the life cycle of a service is long, the frequency with whom firms replace the existing services is lower and so they need to innovate less. This sentence might confirm why these firms have lower level of service (product) innovation, for process innovation we could affirm that because firms that pursue standardization try to achieve economies of scale and cost reductions thanks to routines activities, continuing changes and adaptations in the production processes do not allow the service provider to reach the desired objectives. Other ideas assume that innovation in standardized service firms are more easily commercialized to a wider range of clients. Unfortunately, those are only hypotheses made by the literature and not confirmed by empirical data.

It is difficult to explain the relation between standardization and customization regardless the level of innovation, what appears is that firms are lower innovators when they standardized the services, than firms that pursue customization, the relation could be additionally complicated considering firm size and the sector of activity. Standardized output seems to be associated with large firms that aim to reach economies of scale, in this view it is observable that KIBS firms are relatively of small dimension with some exception, but the reality is that firms compete through different strategies independently from their size and the sector in which they operate.

Among innovating firms, they tend to increase the R&D activities when they chose to customize their services, more precisely, the level of intensity in the R&D activities could varies across sectors, indeed these activities are more likely to be conducted in technologically oriented sectors. Reassuring, the share of firms that perform R&D activities increase when services are customised to meet specific client's needs (Tether et al., 2001).

When KIBS have to decide how to develop and deliver a new service, they will invest money and time to design the service so if they can replicate the innovation, making it available to other clients, they will increase the potential profits from the new innovation, because when KIBS can replicate their innovations they can also monetize their efforts. KIBS able to replicate their innovations can have positive results on profitability and they can do this with modular services. So innovation in KIBS is associated with customization, but the service delivered should maintain a certain level of standardization through standard modules, in fact the best performing firms are those that simultaneously are able to conduct exploration and exploitation activities (Campagnolo & Cabigiosu, 2015), in the sense that companies, after having invested in research activities, should be able to monetize (exploitation phase) the new insights acquired. The above mentioned trade-off between customization and standardization can be overcome through modular services, modularity involves the standardization of interfaces and allows the firm to deliver different services, through the combination of core modules, at lower costs (Greer & Lei, 2012). Modularization offers a potential solution because it couples customization with productivity. Modularization in services is associated with the development of standard processes: firms perform back end activities (production) that are standardized process, and deliver customized services during the front end activities (Bettioli et al., 2012).

A deep focus on client's needs, reduce the possibility for KIBS firms to replicate the service for other different clients. Customization does not allow the company to replicate the services in order to amortise, among different clients, the cost of the resources absorbed during the innovation process and the production of the services. When KIBS firms exchange information and knowledge with clients in order to develop a customized service, they may identify new opportunities. Customization push KIBS firms to seek new solutions to satisfy customers' needs, as consequence customization and innovation are complementary: customization allows for innovation, but it is not necessary the best performing solution (Campagnolo & Cabigiosu, 2015). From the point of view of the innovator, in order to be successful in the long run, is not only important to be innovator and launching new services, but is also important being able to exploit innovation repeatedly. When KIBS provide more standardized services to clients, in order to distribute costs, there is less innovation (Greer & Lei, 2012). Many issues about collaboration with clients are still open, this special relation certainly impacts on KIBS performances and thus we need to understand to what extent KIBS

should collaborate with clients and how, which is the right balance between standardization and customization.

## **2.6. Conclusions**

Co-production management has been used to describe KIBS-client relation because it emphasizes the client's contribution to the partnership. Several benefits could arise from the network created with customers, KIBS firms create many interactions thanks to which they get access to complementary skills and knowledge to accelerate learning and product development. But managing the co-production relation between KIBS and their clients could be complex and costly. The relation between KIBS and their client is a knowledge interaction which involves mutual learning and shared participation, these can be enhanced through trust, proximity, adequate problem management strategies and intense communication. KIBS should apply appropriate performance enhancing tools to ensure that the relation allows the company to grow and to create synergies, otherwise the relation is only resources consuming and the benefits recognized by the literature on collaboration with clients are not realized. Client's knowledge inputs are necessary for KIBS to design the service, the Nonaka and Takeuchi model emphasizes the importance of both tacit and codified knowledge. While in the first chapter the distinction between technical and professional knowledge differentiated KIBS according to their knowledge base, here the distinction is between the form of knowledge exchanged, tacit or codified. KIBS should always keep in mind that collaboration with clients increases the knowledge flows and the possibility to develop innovative ideas, but they must also understand how their offer fit with customer's requirements, otherwise the relation does not lead to the value creation. Co-production is generally associated with service customization, but an extreme focus on customer adaptation reduce the possibility to replicate the innovation, therefore KIBS have to find a solution to balance the trade-off between customization and standardization to achieve growth.

Companies try to be competitive creating value for their customers through service innovation, from one side innovation in KIBS is performed "for" customers, but from the other side innovation is performed "with" customers because they play various role during the innovation phases. The rise of the relationship between service provider and lead user, has changed the way in which organizations and innovations are studied, firm boundaries are less clear and size cannot represent anymore a weakness for innovation (Tether 2002)





## CHAPTER 3

### Evidences on innovation in KIBS

The importance of innovation for the firm competitiveness is broadly recognized also in services, but it is less intuitive to identify than in manufacturing either because innovation was for a long studied on technological bases, either because the service characteristics make difficult to measure innovation. The classical view of services as “passive adopters of innovations” or merely “receivers of technologies” has been abandoned, and it is also confirmed by the role that KIBS are occupying in the knowledge based economy as co-innovators. Innovation itself is a learning process to acquire and generate new knowledge therefore it is not only a technological process, but also organisational and social aspects have to be considered. KIBS features, regarding the customized nature of the service and the client supplier interaction, moved scholars to study how innovation occurs in KIBS and how it affects the firm growth. The chapter is organized as follow: section 3.1 investigates how service firms innovate, identifying differences and similarities with manufacturing firms; section 0 emphasizes the importance of cooperative arrangements as suggested by the open innovation paradigm; section 3.3 shows some patterns of innovation; section 3.4 explains how the interactive relation between KIBS and their client generates new knowledge and why innovation is a learning process; section 3.5 focus on the features of product and process innovations; section 3.6 analyses how different innovation types entail different innovation strategies and implications on firm growth; section 3.7 concludes.

#### **3.1. Innovation in services: differences and similarities with manufacturing**

Innovation is the primary source of economic growth, industrial changes and competitive advantages, companies innovate to gain distinctive competences and to improve their performances. Market competition push companies to introduce new high quality products faster and better than competitors. This trend is observable both in manufacturing and in the service sector, while in the past, services were considered as having a minor role, now they are taking a relevant one.

Conceptualizing innovation in services is not an easy task, the characteristics of the service output make difficult to determine the impact of new service innovations over firm performances, a service is not physical and not easy quantifiable, it is a sequence of operations to solve a problem (Gallouj & Savona, 2009). Some service innovations are more visible and

tangible, but generally the service characteristics are intangible and innovations are related to new concepts, ideas or solutions to problems. Innovation is different from variety, for example you can propose a customized service, adapted to specific customer's need, without pursuing innovation. Understanding whether a service involves new knowledge and not only a mere variation arises some issues due to the service nature itself. For a long innovation in services has been studied starting from the innovation process in manufacturing firms, but this seems to be not appropriate. The growth of the service sector requires to understand whether or not services innovate and whether innovation in manufacturing is appropriate to describe innovation in services.

The traditional approaches (*technologist* or *assimilation approach*) of the literature reduce innovation as the external adoption and the use of new technologies, it tends to apply the same framework used for conceptualizing innovation in manufacturing also to services (Gallouj & Savona, 2009). The main argument is that the service sector is becoming technology and capital intensive, this is primary linked with the diffusion of ICTs, and this view tends to overlook non-technological aspects of the creation process. Services were qualified as supplier dominated, in the sense that they were receivers of new technologies from manufacturing firms and not pure developers. The shared view was to consider service firms as dependent from the adoption of external innovations that increase productivity and facilitate the delivery of new services. Since services have limited capabilities or resources to perform typical R&D activities, they were considered to be less innovative than manufacturing in particular for what concern innovations developed internally, therefore they are defined as passive innovators. As den Hertog (2000) underlines:

*“the dominant view of innovation in services portrays the process of supplier-dominated, with service firms being dependent on their suppliers for innovative inputs”.*

The reality is that services tends to innovate differently from manufacturing firms with greater emphasis on “soft skills” (Tether, 2005), or more precisely, service companies follow different innovation patterns compared to manufacturing firms (Hipp & Grupp, 2005), which does not necessary imply that services and manufacturing have totally different innovation modes.

A different approach (*service oriented* or *demarkation approach*) moves away from manufacturing centred models to focus on the peculiarities of service innovation, it recognizes that innovation is not only a matter of “technology” but it involves also non-technological

aspects. The service peculiarities are the key to understand innovation, their intangibility and the interactive nature make the service not physical and thus innovation is difficult to record. The intangibility makes difficult to store, transfer and to display the service in advance and to show its features to customers, in addition the literature underlines how patent protection has a minor role (Hipp & Grupp, 2005; Miozzo et al., 2016), because it is difficult to protect innovations in services through patents or some kind of intellectual property. Services are consumed when they are produced and customers are involved in the co-production process. Services are difficult to replicate exactly time by time, so they maintain a certain degree of flexibility which makes difficult to differentiate between a simple service variation and a more complex innovation. From the concept of service intangibility, it is easy to derive the idea that not only technology is related to innovation in services (Hipp & Grupp, 2005; Tether, 2005; Gallouj & Savona, 2009). Services are characterized to have close relations with clients, internal and external forces are integrated and it can represent a success factor, but the co-production relation with customers could complicate the identification of the innovation, because it could be difficult to properly identify the right source of innovation.

Innovation concept should be separated from purely technical innovations because firms adapt their services to customers' needs combining soft and hard technologies, human capital and employees' skills play a central role because service companies do not perform classical R&D activities or they do not have dedicated R&D departments. Of course, there are certain service companies operating in medium and high-tech industries, for which it is possible to affirm that they are more active in R&D and they are comparable to manufacturing firms. In summary, internal R&D plays a minor role in certain types of service firms compared with manufacturing. What matters in services is the creation of value for customers and their ability to identify customer needs, thus innovation cannot be seen only as the adoption of new technologies. Other than technological capabilities, also human and organizational capabilities are important, indeed many services derive from continuous interactions with clients and they have more tacit form of knowledge. Assuming that all the firms have access to the same technological innovation, competition in services is not based principally on the adoption of new technologies, but on the skills of the workforce.

With the expansion of the studies in service innovation, it emerged that many services contribute to innovation process, especially for client firms and thus they are not merely receivers of innovations; the focus on technological innovation only has been reduced, recognizing that also non technological elements can contribute to service innovation (den

Hertog, 2000). As consequences, it is possible to refuse the hypothesis which consider service firms as passive adopters of new technologies, also service firms do produce innovation internally and do not depend only on industrial innovation, but the role of R&D activities and technology has to be considered specifically for this sector, innovation is not just a matter of adoption of new technologies but the introduction of new methods that ultimately increase customer value.

The boundaries between goods and services are becoming more blurred, goods have some immaterial components that are determinant to influence customers' choices, and certain activities are standardized because it makes cheaper to the deliver the service. This convergence requires to conceptualize an approach that generalize the theory on innovation, Gallouj and Savona (2009) tried to develop a common framework to enlarge the view of innovation (the *integrative or synthesizing approach*). Products, goods and services, are redefined in a way that allows the authors to generalize a theory of innovation for material and immaterial products. In the authors' view, a "need" is a function that can be satisfied through the consumption of a good or a service. In this way, overcoming the distinction between goods and services, that makes more difficult to conceptualize innovation, what generate an innovation is a change in the product's (either good or service) characteristics: the value for the final user, the technical characteristics of the product, the process to generate value, supplier competences.

Table 4. Towards a theory of innovation in services

|   |   |  |
|---|---|--|
| <i>technologist or assimilation approach</i>    | Innovation in service depends on the adoption of new technology, acquired mainly from suppliers | Innovation in service is assimilated to innovation in manufacturing    |
| <i>service oriented or demarcation approach</i> | Innovation involves also soft aspects   | The approach tries to remark the specificity of innovation in services |
| <i>integrative or synthesizing approach</i>     | Innovation is a change in the product (good or service) characteristics                         | The approach overcome the distinction between good and services        |

*Personal elaboration*

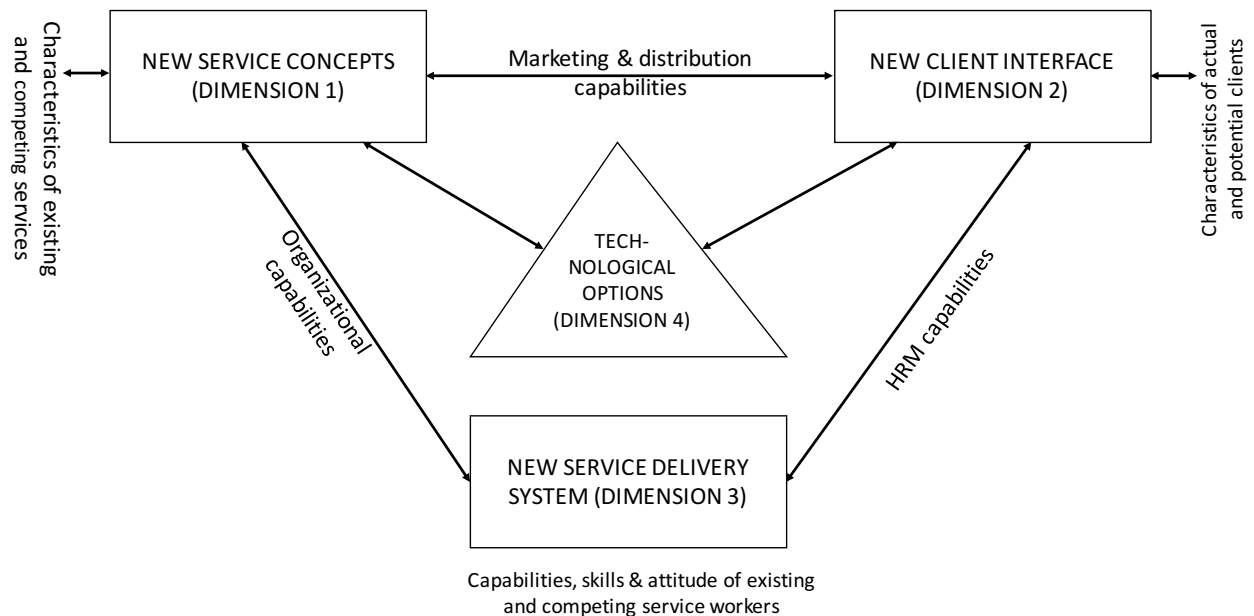
Services innovate differently from manufacturing in the sense that they tend to be less engaged in technological innovative activities, more oriented towards organizational changes, putting emphasis on soft sources, while manufacturing firms are concentrated over hard source of

innovation; other differences concern the sources of innovation, manufacturing firms are likely to develop advance technologies through internal R&D (hard strengths), purchasing machinery and equipment, collaboration is principally with universities and research centres, instead services get new technologies through collaboration with clients and suppliers, they emphasize internal workforce's skills and competences (soft strengths) (Tether, 2005; Miles, 2005).

Notwithstanding these differences, in general, it is not possible to distinguish a totally different pattern of innovation, or a "unique service patterns of innovation", there are various mode to perform innovation activities and, among these, some are more appropriate for services and some others for manufacturing, thus also inside the service sector, given the variety of service activities provided, there are different approach to innovation that combine "soft" and "hard" skills, internal technologies and collaboration with customers (Gallouj & Savona, 2009; Tether, 2005).

The concept of innovation should focus on three pillars: the firm output, the internal organization (referred to the design of the activities for producing and delivering the output) and the external organization, which includes firm's relationships with clients, suppliers, competitors and research centres. Service innovation is rarely limited only to the change in the service characteristics, but it can be identified with new way to distribute the product, new client interaction or new organizational design, innovation for example could cover also functions like marketing or sales when the firm aims to propose innovative selling method. The literature (Gallouj & Savona, 2009; den Hertog, 2000) recognizes a patterns of elements that if changed a service innovation is achieved, these changes come from carrying out non routines activities aimed to improve the actual service provided, with the expectation to have a positive effect on performances. Den Hertog (2000) developed a four dimensional model (Figure 6) to conceptualize innovation in services.

Figure 6. A four dimensional model of service innovation



Source: Den Hertog, 2000

The first dimension is the service concept, innovation occurs as a new idea or concept to apply in order to find the solution to some specific problems, generally it is not material and tangible. It is difficult to determine when the idea is really new to the market or for the firm. A second element is the relation between service provider and its clients. Goods and services are both produced in order to capture client-specific needs, but especially in services they play the role as co-producers. Changing the way in which the service provider interacts with clients can be itself an innovation, even if it is difficult to associate the contribute to innovation to one of the two parties. The third dimension is the internal organization that has to be managed properly to allow workers to perform their activities and to develop innovative services. On one hand the internal organization must be designed to facilitate the employees' job, on the other hand it should facilitate also learning and training activities in order to improve employees' skills. The fourth dimension is probably one of the most debated, it is referred to technological innovation in services. Most of the times innovation is considered only in relation to its technological parts, certainly it facilitates the service delivering, but service innovation is also possible without technological innovation. Any time a new innovation occurs a new idea will be conceptualized, the interaction with clients will be different, the company will assume a new organizational design or a new technology will be introduced.

In Table 5 I propose an example of new delivering system, in this case the service provider introduces a new system to deliver the service to customers, but this is not guarantee that customers will accept the new delivery mechanism.

*Table 5. An example of delivering system*

**Box. An example of new delivering system.**

New technologies are changing the way in which companies work. In particular, on-demand technologies, IT and the diffusion of internet allow customers to have access to numerous service everywhere. The digitalization is getting inside small and micro firms, this can improve internal process and allow the company to build competitive advantages. For example, companies are changing the way in which they deliver their services. With references to the four dimensional model developed by den Hertog, many companies are developing new service delivering system, through the use of internet and mobile devices, services are accessible from everywhere companies are adapting their internal organization to new way to deliver the services becoming more flexible. Less face-to-face interaction are required and the companies can focus their efforts in different activities of the value chain rather than delivery the service through personal interaction. From customers' perspective things are more complicated; in services, the consumption phase often overlaps with the delivery process. The introduction of innovative delivery process might be particularly convenient for KIBS that can improve their internal efficiency and effectiveness, but customers might not be willing to accept completely new delivering systems when these do not provide any benefits to their organization.

*Personal elaboration*

The four dimensions are linked together and different capabilities are needed according to the type of service; each service innovation is characterized by at least one change in the above mentioned dimensions, or it could be also a combination of changes. The importance of the four dimensions and the links among them vary across individual services, innovations and firms.

### **3.2. Towards the open innovation paradigm: co-operative arrangement for innovation between firms and their clients**

Firms innovate for many reasons and innovative stimulus can derive from the external environment, such as competition, customer demands and new regulations, or from the internal organization, such as the need to gain efficiency, distinctive competences or increasing the service quality; in both cases, firms innovate to adapt to the surrounded changing conditions and ultimately to achieve and improve their performances.

KIBS are depicted as innovating firm for their own and for client firms, in particular it is given frequent emphasis on the interaction between service provider and clients, because many services require client's knowledge as primary input. Thus, innovations are co-produced and services are the output of a different producer-consumer relationship from that in manufacturing. Clients have a significant role in KIBS as source of innovation, either because they collaborate to the service production, either because their needs are the starting point to develop innovative solutions.

New models of innovation follow the "open innovation" paradigm, this suggests that the advantages a firms get from internal R&D have declined, thus they do not rely anymore only on internal R&D but they are able innovators when they can collect knowledge from a wide range of external actors. The role of client in KIBS firms is consistent with the role that external actors play in the open innovation paradigm. Entrepreneurs are not anymore standalone innovators, but they work closely with a network of actors, therefore innovations are not developed only internally through the use of internal resources, but also outside the organizations. Cohen and Levinthal (1990) consider the ability to make use of external knowledge a fundamental element for innovation (Cohen & Levinthal, 1990, cited in Laursen & Salter, 2006). Ideas could born also outside the company, because in the surrounding environment there are many actors with whom the company can collaborate. Innovation boundaries are changing, firms that are part of a network and invest in external relationships are likely to have better innovative performances because it gives the possibility to get new ideas and knowledge from outside, while firms that are too focus internally risk to miss profitable opportunities. New models for innovation underline the increasing importance of relationships with external actors, this suggests to interact with lead users, suppliers, institutions and eventually competitors inside the system. A survey analysed co-operation arrangements for innovation among innovating firms and it shows that most of them co-operate in particular with



suppliers and customers (Laursen & Salter, 2006; Tether, 2002). Co-operation for innovation is defined by Tether (2002) as:

*“active participation in joint R&D and other technological innovation projects with other organization. It does not necessarily imply that both partners derive immediate commercial benefits from the venture. Pure contracting out work, where there is no active participation is not regarded as co-operation”.*

Current competition pushes firms to introduce high quality products faster and cheaper than competitors, to meet this challenge, entrepreneurs put attention towards the strategy that can allow them to be innovative and to provide products with higher level of novelty (Nieto & Santamaria, 2007). However, in the contemporary era, innovation cannot be only an internal process, but also external sources and linkages play an important role because they have the potential to increase the firm internal innovation ability. External linkages stimulate creativity, reduce risks and accelerate the quality of the innovation; in addition, collaboration signals the ability of a company to interact with external actors, this may be beneficial to set up further relations and inter-firm linkages to promote innovative activities (Caloghirou et al., 2002, cited in Love & Mansury, 2007; Nieto & Santamaria, 2007).

The choice to collaborate with external partners is a variant of the make or buy decision, these generally depend on transaction costs which make the exchange of an asset, tangible or intangible, more expensive, collaboration is a third alternative that can be highly efficient.

The use of external sources is particular important for service firms, indeed they are more likely than manufacturing to collaborate with customers and suppliers (Tether, 2005). Love and Mansury (2007) observed that customers involvement is the most common form of external link, their model showed that the greater were the inputs provided by customers, the higher was the probability to innovate. When the company aims to develop more radical innovation, the existing knowledge base is not enough but it should engage in cooperative arrangements for innovation with external sources. External sources of knowledge, especially customers in the case of KIBS firms, allow the company to develop not only more radical innovations, but also to gain more sales from these innovations (Leiponen, 2005). Tether (2005) assessed that cooperation with customers to access advance technologies is more widely used in services than in manufacturing.

Differences in innovative activities depends on how firms collect knowledge from different external sources, the way in which firms search new ideas and technologies is central for

innovation models. The use of external sources is shaped by the firm's ability to conduct "search activities", Laursen and Salter (2006) have developed two concepts for studying the influence of external linkages on innovation and performances, the first refers to external search breadth, which is the number of external source or search channels over which the firm rely when it conducts innovative activities; the other is the external search depth, which is how much (how deeply) a firm get information and knowledge from external sources. The positive impact of external source of knowledge over firm innovativeness and performances does not depend only on the absolute number of external relations, but also on the quality of these relations. Not all the external sources provide a positive impact on firm's performances, but the firm should be able to identify the most relevant ones. In the specific case of KIBS firms, the service provider will choose among those clients that can bring value added to the service in question. Even if it is difficult to implement the optimal search strategy, anyway, firms that conduct search strategies improve their ability to innovate and to adapt to the changing environment. Creating external linkages has some costs, companies may have an over-search approach and an immoderate searching risk, these make search activities expensive and not profitable, therefor research of external sources, and in our case client searching or attraction, should be moderate and appropriate to KIBS firm's activities, internal competences and scope.

### **3.3. Patterns of innovation**

Different modes of co-operative arrangements for innovation can be identified in services and these are categorized in five different patterns: supplier dominated, innovation within services, client led innovation, paradigmatic innovations, innovation through services (den Hertog, 2000). In each of these patterns the service firm plays a different role and in each of them we can find a different mix of linkages between three main actors: suppliers, which provide inputs as equipment and human capital to the service firm; the service firm that is working for innovating; clients, intermediate or final user, to which the innovation is provided. In practice, it is possible to find many variants to these patterns.

The classical idea is to consider innovation in services as *supplier dominated*, and the service firm dependents from supplier's input because innovation were mostly linked to technological concept developed outside by external actors and services were seen to be less innovative or "recipients of technologies" rather than "true innovators" (Pavitt, 1984, cited in Tether at al., 2001). Once received, the technological innovations are implemented and disseminated by the service firm, that ultimately satisfies its clients' needs; sometimes the service firm has to adapt

its organisation to the newly developed technologies in order to use it and to offer more efficient service solutions, for example training the employees. Innovations take place also *within services*, these are developed and implemented inside the service firms itself, these can be technological and non-technological, or a combination of the two. In this pattern, external actors contribute only through support functions. In the case of *client-led innovation*, the service firm will try to solve a specific customer problem, thus innovation is driven by the client need. Even if the innovation is often a response to a clear market need, in the sense that it is demanded by large market segments, in our case the innovation is requested by a single client. *Paradigmatic innovation* occurs when new complex and pervasive innovation affect all the actor in the value chain, it determines a substantial technological change and introduce completely new technological innovation in the market, it is often associated to a technological revolution. This pattern could be driven by regulation, resource constraints and other deep changes that require to introduce an innovation across many phases of the value chain. The classical view in service innovation is that of supplier dominated, but the contribution of service firm to innovation is broader than this, indeed the work will refrain to associate it to KIBS because they are specialised suppliers of knowledge and responsible to foster the innovation process inside client firms (Castaldi et al., 2013). Therefore, it is advisable to use a different and more complicated pattern for KIBS which is named *innovation through service*, here the service firms have influence over the innovation process that takes place within the client firm. The service firm provide knowledge to support the innovation process of its client:

- Providing expert project manager with the skill to implement the innovation;
- Providing innovative tailor made software package;
- Providing training or written advice regarding product selection and implementation;
- Providing advice on how to conduct the innovation process, or providing support tools to foster creativity among teams in the client organisation.

This pattern is the one corresponding to KIBS, regarding the different circumstances the role of the intermediate service provider may vary.

Table 6 is a short example of how an IT providers deliver its innovative solution through services.

*Table 6. Delivering innovation through services*

**Box. Delivering innovation through services: the case of the IT provider**

Today customers look for services to satisfy their needs, sometimes even the value of a tangible product depends on the service embedded, like customer services and post-sale services. Delivering innovation through services is even more important in the service sector. Companies must understand how to transfer the value of their innovation to their customers. Many manufacturing and industrial companies expect their business will evolve through the introduction of IT solution and business integration system. Thus, they rely on technology base KIBS to acquire innovative solutions. T-KIBS (Miles, 1995) are companies with a strong technological knowledge base, they develop software that manufacturing and industrial companies use to improve their process and performances. Wintech S.p.a., one of the company of my sample, is a system integrator that provides IT solutions to professional firms, SMEs, banks, insurances and public administrations. The company is involved not only in producing new IT solution, but after the sale it provides consulting and training services to the buyer company through its employees. The company is not simply involved in the production and sale of a technology, but it also helps the clients to integrate internally the new solution, providing expert employees consultant. These post-sale activities, allow Wintech to transfer the value of its innovation.

*Personal elaboration*

The innovation process is a set of activities to develop new product or process but “how” and “when” new ideas are generated can vary, indeed we can identify three models that differ in the moment in which new ideas are developed: separate planning, rapid application, a posteriori recognition of innovation (Toivonen, Tuominen, Brax, 2007).

The model of *separate planning* distinguishes separately the two phases of planning and production, this is the common case in which a team works in the R&D department to study innovative solution to supply to the market, the production phase is separated and it starts only at the end of previous one. The company gets the idea from one of its customers, but then development and production are separated. In all the development stages, the client’s role is important: client stimulates the basic idea, tests the idea, provides constructive feedback and

offers advises for future developments. Many services do not result from deliberate R&D activities, but the recognition of new ideas occurs after the service provision. In the model of *a posteriori recognition of innovation*, the service provider recognizes the possibility to replicate the know-how previously acquired also for further services: a service previously planned for the purposes of one client, then it is considered for a wider application. While in the model of separate planning, innovation activities are programmed and new products or processes are developed after the scouting of several ideas, in the model of a posteriori recognition the activities emerge as consequence of a learning process, in the sense that the firm recognizes the possibility to innovate without having previously manifested this intention. The model of *rapid application* does not separate the planning phases from the production one, but when a new idea emerges it is offered to the market and it is developed with clients during the service delivering. In this model, there is not a pre-study before the launching of a new service, or, if it is, separate testing activities occupy a short part inside the whole process. The relation between service provider and client is aimed to improve the service features and to generate positive benefits on both the organizations, but clients may not be aware about the novelty of the service and about their role as co-producer. The fundamental change in respect to the previous models is about the absence of pre-testing and separated R&D activities. This model is probably the one closer to KIBS, where the service development is an ongoing activity performed once a client need arise, thus innovations are developed contextually with the activity of providing a service to customers. Of course, this does not exclude the possibility for KIBS to innovate also outside the interactive relation with customers.

The authors (Toivonen et al., 2007) suggests three different reasons to use the model of rapid application. The new idea can be tested directly in the market without investing big amount of resources in R&D activities, because KIBS are often companies of small dimensions, this seems to be appropriate. Second, some issues cannot be adequately solved without operating in real markets, some problems or inconveniences arise only once the service is commercialized. The company's internal knowledge certain represents an important input and stimulus, but is has to be combined with client's knowledge. Finally, clients may manifest the need for immediate use of the service, thus the company cannot dedicate long time to the development phases.

All the models recognize the importance of the client contribution but they are different in respect to the moment in which the service provider recognizes the innovation: in case of separate planning, new ideas are recognized during dedicated R&D activities; in the a posteriori recognition model, firms identify the possibility to commercialize an innovative idea after that

it has already been applied to some customers, the company understands that a specialized know-how has been developed internally and it can be exploited externally among a wider client base; the model of rapid application links together the development and the production phases when the service is delivered to clients, this also emphasizes the absence of dedicated R&D department inside KIBS, as it is underlined in the literature on innovation in services.

*Table 7. How and when new ideas born*

| <b>Model</b>             | <b>How</b>   | <b>When</b>   |
|--------------------------|--|---|
| Separate Planning        | Planning precedes production, the two phases are separable   | Ideas born inside R&D departments during dedicated activities   |
| Rapid application        | Simultaneous planning and production   | The born, the development, the production and the delivery of new ideas occur during the interaction with clients |
| A posteriori recognition | There is not a real planning phase, but the service provision precedes the finding of innovative ideas | New ideas are recognized after that a service has been already delivered to one client                            |

*Personal elaboration*

Service are acquiring a key role in the innovation process through the combination of internal and external knowledge, in particular the benefits of innovation through collaboration accelerated the number of alliances. KIBS firms develop collaborative arrangements with client and their role goes further the simple “supplier-dominated view”.

### **3.4. A learning based approach to understand innovation in KIBS**

The widely recognized feature of services regarding the close interdependence between the production and the consumption phases, is reflected also in their innovative activities, indeed new ideas emerge during the interaction with clients. Innovations in KIBS are developed simultaneously with the production of the service and the emergence of a new idea is principally linked to the need of developing innovative service to capture customers’ requirements or to improve the internal company process in order to favour the service delivery. In both the cases, new ideas are almost driven by the market, especially by customers, and they are developed contextually with the service delivery. There could be some short “desk-study” activities, but

not “separate testing activities”, which instead take place once the client has received the services, *i.e.* ideas are directly tested in the market. In addition, the urgent need of the service from the client makes not possible to spent a lot of time on testing the new services. This emphasises the role of clients in the co-production process, indeed they are called to transmit feedback about the service.

KIBS plays a variety of role in the innovation process (Doloreux & Shearmur, 2010):

- KIBS, as *facilitators of innovation*, support clients in their innovation process, but the innovation does not originate from KIBS firm;
- KIBS, as *sources of innovation*, initiate and develop innovation activities in client organization;
- KIBS, as *carriers of innovation*, transfer existing knowledge among organizations and industries, in order to apply it into new context;
- KIBS, as *innovators in their own right*, implement new services or processes.

Freel (2006) showed that R&D expenditure, highly skilled employees and cooperative relationships increase the innovation outcome. But this could appear too simplistic, making one step forward it is noted that innovation in services rely more on “soft” sources (knowledge, cooperation) than on “hard” source (technology, R&D). Client participation is one of the KIBS’ characteristics and thus collaboration with client has a greater incidence on KIBS innovativeness. Regarding R&D, the common view is that services make less R&D, but some T-KIBS are similar to high technology manufacturers in relation to R&D effort and technology intensity, while P-KIBS are less likely to conduct R&D (Freel, 2006). These activities are generally conducted during the implementation of ongoing projects: KIBS provide services to satisfy customers’ needs by delivering innovative solutions, which are the output of knowledge intensive activities, thus when new knowledge emerges, it can be object of future developments and applications. In a certain sense, R&D activities are client-led, because the innovation is developed in response to specific needs. For this reason, collaboration with clients is of considerable importance for innovation in KIBS.

The interaction between KIBS and their clients principally involves knowledge, which is a fundamental input in the innovation process, indeed innovation in KIBS is often studied from the perspective of how their knowledge fosters innovative process in client firms. The collaborative relation with client, that characterizes KIBS, suggests to talk about “co-innovation”: since KIBS deliver a service to solve a specific customer need, innovation is stimulated by client’s requirements.

The concept of co-production with clients is referred to the client engagement in the creation process and it falls within the Open Innovation paradigm, firms learn from customers and work closely with them, collaboration with clients became a moment for exploring new ideas and solutions to problems thanks to the knowledge transferred from clients to the service provider (Greer & Lei, 2012). Client firms committed to innovate need specialized knowledge so they are likely to co-innovate with KIBS, new innovations are jointly developed with input of both KIBS and client firms. What is remarkable is that innovation in the client firms would not occur without the KIBS support (Castaldi et al., 2013), instead the contrary is not totally true because, KIBS can be also stand alone innovators in case of organizational innovation. When KIBS and clients co-produce, they bring different set of capabilities and competences, they develop their knowledge base and generate mutual contributions; thus, cooperation with customers represent the main source of knowledge (Corrocher & Cusmano, 2014).

KIBS propensity to innovate depends on their knowledge base, which is the combination of internal and external knowledge, expanding their knowledge base, they could improve their innovating capabilities. Being part of a network increases the opportunities to share information and to have interactions with external actors to increase the knowledge base. KIBS are integrated into an innovation system, which is defined by Lundvall (1992) as:

*<< a system of innovation constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful knowledge >>*

(Lundvall, 1992, cited in Wong & He, 2002).

This definition suggests us that KIBS innovate through interaction with external actors (mostly clients) in order to acquire additional knowledge and to enrich their knowledge base, this view underlines the importance of external and diversified sources of knowledge to develop innovative solutions: clients, suppliers, research centres, universities, laboratories. These different sources will provide a diversified set of more or less technical competences that will allow the company to introduce innovations that are mainly new to the market.

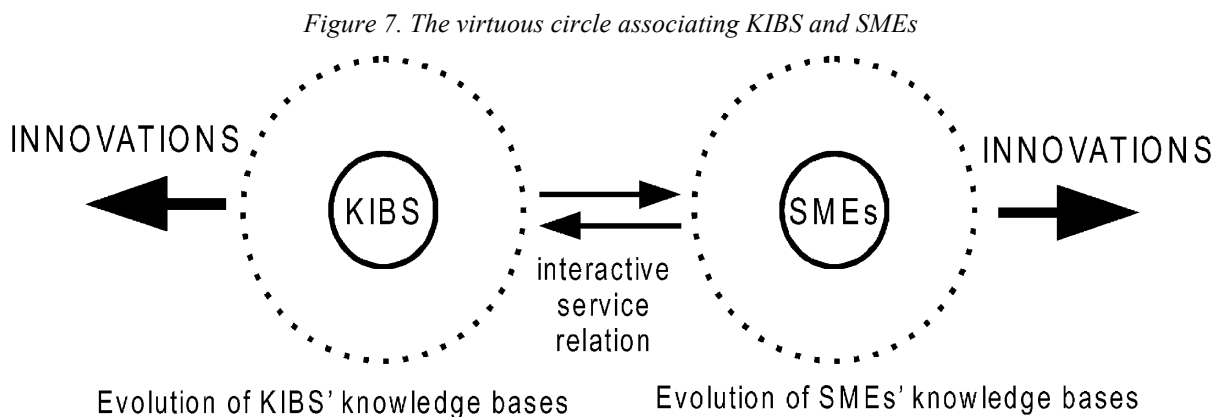
But, relying on external sources is not the only solution for successful innovations, because also the company's internal resources and competences shape the way in which KIBS innovate. Innovation, as process of acquiring knowledge through interactions with external actors, can be defined as an interactive learning process (Corrocher & Cusmano, 2014).

Several studies on innovation in KIBS underline the benefits they provide to client firms and ultimately to the local development of the geographic area. At the same time, it is also important



to study the contribution of innovative activities inside the KIBS sector itself, understanding how they perform these activities and the impact over their performances.

The innovation value chain, which encompasses the phases of knowledge acquisition, recombination and diffusion, has already showed the existence of a three-stage model to process knowledge, this cannot be other than an interactive process itself. It is properly the interaction with clients that extend KIBS's knowledge base and, in turn, increases the possibility to innovate.



As showed in Figure 7, the virtuous innovation circle between KIBS and SMEs contribute to their respective innovation capabilities and outputs, during KIBS and SMEs interaction, their knowledge base evolves because they acquire new information, that are principally exchanged to design, deliver and acquire the service. KIBS, thanks to their services, foster innovation in SMEs, but they also develop internally new solutions thanks to the inputs provided by SMEs, these new solutions are developed in terms of product or process innovations.

In summary, knowledge exchange is bidirectional because both partners provide information during the interaction to improve the success of the partnerships; also innovation is bidirectional, in the sense that KIBS not only foster innovation in SMEs but they are also innovators by themselves. What is remarkable is that some innovations, not all, would not occur without this interaction, indeed this bilateral learning process expand KIBS' innovative capabilities: when they are engaged in interactive relations with manufacturing firms, to provide innovative service solution, their propensity to innovate increases (Wong & He, 2002).

Many management studies tried to identify the firm's internal characteristics that affect the innovation behaviour, some of them used the "resource based view" (RBV) which recognises differences among firms and the effect of internal resources on the business strategy. The RBV

focus on the company's capabilities and resources, when these are not imitable and non-substitutable from other organizations, then the company can develop distinctive competences. This means that firms are different and each one has its own set of internal resources and capabilities, both tangible and intangible, that shape the way in which the company performs its activities and the innovation process. According to this approach, we can derive that also innovation in KIBS is shaped by their internal resources and capabilities.

Other than applying their knowledge, they also acquire knowledge from customers (principally). Firms continually engage in activities to accumulate knowledge, innovation is a learning process because KIBS are required to continually improve their knowledge base to develop new services. This learning process cannot be studied without considering KIBS' internal resources and capabilities. Cohen and Levinthal coined the term "absorptive capacity" to explain the innovation capabilities of the firms: it is the "ability of a firm to recognise the value of new external information, assimilate it and apply it to commercial ends" (Cohen & Levinthal, 1990, cited in Musolesi & Huiban, 2009). Company's innovativeness depends on the level of its prior knowledge; employees' motivation, skills and capabilities (knowledge) are important for innovation in KIBS because these shape the way in which KIBS improve and expand their internal knowledge base and ultimately the way in which they introduce new products or processes. The company ability to recognize and acquire external sources of knowledge depends on its actual internal resources. Industries differ in respect to their knowledge base and knowledge absorptive capacity, thus innovation capabilities and strategies varies across KIBS: they use their professional or technological knowledge to deliver innovative service for their clients. In KIBS, knowledge is embodied in individuals who are the main source of knowledge and competences, thus the KIBS knowledge base is linked to their employees' knowledge, the way in which KIBS innovate and interact depends on their employees' knowledge. The success of the business operation in KIBS depends on the skills and competences of their employees, KIBS generally employ big shares of high educated employees, in addition on the job training is also very important to improve their skills and knowledge, indeed KIBS continually support learning and innovation process to maintain their competitiveness (Leiponen, 2005).

In the classification proposed by Miles (1995) KIBS are distinguished according to their knowledge base in professional (P-KIBS) and technological (T-KIBS) service firms, this suggests to recognize different innovation modes because KIBS have different knowledge contents. Tether and Hipp (2002) investigated the innovation activities of knowledge intensive

services in comparison with services more generally. They found some differences between the two groups, but even among knowledge intensive services there was considerable variation (Tether & Hipp, 2002). Malerba (2005) distinguished different patterns of innovation according to specific sector's characteristics, firms are linked by some commonalities for a given demand group, but at the same time they are heterogeneous, the dynamic inside the KIBS sector depends on the interdependencies across their knowledge base (Malerba, 2005, cited in Consoli and Elche-Hortelano, 2010). Freel (2006) in exploring the factors that "explain" KIBS innovativeness, differentiated KIBS following the distinction introduced by Miles (1995).

Doloreux and Shearmur (2010) compared patterns of innovation across three KIBS industries that have different structures, different nature of products, different technologies and knowledges (Computer System Design and Related Services; Management, Scientific and Technical Consulting Services; Architectural, Engineering and Related Services) and analysed how KIBS innovate and whether they innovate differently. They showed that there are different patterns of technological and non-technological innovation among the three sectors, suggesting that innovation cannot be referred only to technology and KIBS must be analysed by making a sort of differentiation inside the whole sector (Doloreux & Shearmur, 2010).

Pina and Tether (2016) used the taxonomies of knowledge proposed by Asheim and colleagues (Asheim & Coenen, 2005; Asheim, Coenen, Moodysson and Vang, 2007), which distinguish firm's knowledge base in analytical, synthetic and symbolic, to show how these differentiate the engagement in R&D, design and innovation of KIBS:

- Analytical knowledge defines that part of the knowledge base associated to specialised skills (often identified by some type of qualification) that makes use of empirical testing and rational abstractions, it is developed using formalised models and predefined methods that are made of systematic and organised structures and codes of conduct, it is based on the application of scientific methods;
- Synthetic knowledge is pragmatic and focused on problem solving activities, instead of making use of legitimated scientific methods, it is less formalised and more practical, tacit knowledge is central;
- Symbolic knowledge is transferred using signs, symbols, images and sounds.

Firms with analytical knowledge rely more on scientific techniques and perform formal R&D activities as key sources to develop innovative services, this is typical in the IT industry. In KIBS firms that own synthetic knowledge, innovations are developed applying experiences to solve customers' problems and putting emphasis on the relation between consultant (KIBS)

and clients, typical innovations regard the improvement or the customization of existing product or process. Symbolic knowledge is relevant for cultural and creative industries (advertising and media companies, but also architecture and design companies), this knowledge regards the ability to understand, stimulate and manipulate customers' emotions. From the Pina and Theter' analysis, it appears that synthetic knowledge is used in all of the industries, most of the industries use at least two of these knowledge bases with different degrees. The results underline that the "driver" of innovation vary between firms according with their knowledge base. To introduce new product innovations, KIBS with analytical knowledge are more likely to invest in R&D activities; instead, KIBS classified as having symbolic knowledge introduce product innovations investing in design and IT, while firms with synthetic knowledge invest in both R&D and design (Pina & Tether, 2016).

KIBS are organizations composed by individuals, professionals and staff, but also customers are in a certain sense involved in their organization. Thus, innovation should be studied considering the KIBS ability, what is called absorptive capacity, to integrate their internal knowledge with that of the clients; in this sense innovation has been defined as a learning process because it involves mainly humans and their knowledge, but different modes of innovation exist in relation to KIBS knowledge base.

### **3.5. Understanding the effect of product and process innovation**

Innovations are sources of productivity and growth, sometimes the survival or the die of a company depends on its innovating behaviour. In order to manage environmental changes and gain competitive advantages, firms continually need to adapt their organization by offering new product or implementing new internal processes, therefore they adopt different types of innovations in different part of the organization.

Service innovation encompass various dimensions and types, these have different characteristics, different effects on the organization and different purposes. The literature tried to identify and to classify innovation types, some authors have identified approximately 20 innovation types (Zaltman et al., 1973, cited in Damanpour, Walker, Avellaneda, 2009). A smaller list is provided by Doloreux and Shearmur (2010):

- Product innovation: relates to the market introduction of any new or significantly improved product (goods or services)
- Process innovation: relates to the introduction of any new or significantly improved production process (but not delivery, unless this is integral to the process of production/

delivery)

- Delivery innovation: relates to how the enterprise delivers products (goods or services) to customers. Examples include just-in-time delivery, consumer e-commerce, new or significantly improved home shopping services
- Strategic innovation: relates to the implementation of new or significantly modified business strategies. Examples include targeting different markets, implementing new or significantly modified missions
- Managerial innovation: relates to new or significantly modified managerial techniques. Examples include knowledge management practices and quality circles
- Marketing innovation: relates to new or significantly modified marketing strategies and concepts. Examples include new or significantly improved marketing methods.

Among the above mentioned innovations, a different perspective recognizes technological and non-technological innovations: product and process innovations correspond to technological innovation; delivery, strategic, managerial, and marketing innovations represent non-technological forms of innovation that largely overlap with organisational innovations.

There is a big variety of innovation types and more generally they can be classified in: organizational innovation or technological innovations, process or product innovations. These innovation types can be combined in a taxonomy that distinguish also between innovations new to the firm or to the market, innovations that are minor, incremental or radical. As already noted in the four-dimensional model developed by den Hertog (2000), service innovations can be also the combination of different dimensions.

Due to the service nature, is not always easy to make a clear and commonly recognized distinction between product and process innovations. << *A product is a good or a service offered to customers*>> and a process <<*is the mode of production and delivery of the good or service*>> (Barras, 1986, cited in Damanpour & Gopalakrishnan, 2001); while product innovation determines a changes in what the company offers to customers, process innovation determines a changes in how the company produces and delivers the offerings. The literature on innovation does not strictly distinguish between product (as a good) and service innovations, but services are offered in the service sector similarly as goods are offered by manufacturing firms.

A product innovation is a source of innovation for client firms (Ojanen, Salmi, Torkkeli, 2007) and it is introduced to meet external users' requirements, thus it is stimulated and driven by a market needs; clients demand new services and KIBS firms want to develop new services

for existing markets or they want to find new niche markets for existing services, product innovations have external focus, companies that innovate their products aim to differentiate their offering from competitors or to gain cost advantages. Because the focus is on client needs, service innovations can be defined as: the introduction of new services to existing or new clients, or the introduction of existing services to new clients (Damanpour et al., 2009).

Process innovations are related to a change in the company's organization for the production of a product or a service, they have an internal focus in order to increase the organization's efficiency and effectiveness, and to facilitate internal process, production and distribution (Damanpour et al., 2009). New process can derive by the adoption of new technologies or new administrative solutions. New technologies, developed inside or outside, improve internal process reducing delivery time or increasing operational efficiency. In services, technological innovations are often associated with the introduction of IT. Process innovations can be performed not only through the introduction of new technologies but also through new administrative processes: new organizational designs, new tasks and structures, new practices to motivate and reward members, new management process. Administrative innovations are changes in the company that impact indirectly on the organization's work, they modify the administrative system, the way in which knowledge is used and the managerial skills; instead technological innovations have a direct impact on the organization's work because they modify the main operating system (Damanpour et al., 2009).

However, the literature on service is prudent when it adopts the distinction between product and process innovation, because service's features (intangibility, simultaneous production and consumption, limited protection mechanisms, different degrees of customization) make difficult to distinguish between "the product" and "the process", indeed services are often seen as "process", a set of procedures and protocols. The service can be described observing its internal characteristics and its external properties. Externally, a service is observed by the final user who identified a set of characteristics that generate utility and benefits. Internally, the service has some technological characteristics (in *lato sensu*) represented by the mechanisms that generate the utility for the final user, *i.e.* operations carried by the service providers. Then, there are the process characteristics, these are related to the production method, the technology (in *stricto sensu*) applied and the organization's design (Gallouj & Weinstein, 1997).

Musolesi and Huiban (2009) found that the determinants of process and product innovation are different: external R&D have more influence on process innovation, while product innovation is more influenced by internal R&D; the absorptive capacity of the firm has more

effect for product innovation than for process innovation (Musolesi & Huiban, 2009). The adoption of product and process innovations requires different skills: for product innovations the company must be able to understand customers' need, to spot new market trends and to build successful partnership with clients; for process innovations, the firm will require more technical skills to develop and implement its internal activities (Campagnolo & Cabigiosu, 2015).

The literature has developed different taxonomies of innovation, among these, particular importance is given to the concept of innovation novelty, that can assume different degrees in respect to its technicality (incremental or improvement, radical) or can be considered in respect to the timing in the introduction of new product or process (new to the industry or new to the firm).

Gallouj and Weinstein (1997) proposed a definition of innovation avoiding the dichotomy between product and process innovation and concentrating on their technicality. The classification between improvement, incremental and radical innovations is purely qualitative. Improvement and incremental innovations are smaller than radical ones, it is difficult to define the boundaries between improvement and incremental innovations, because the former makes improvement in its strict sense, the latter adds something new. You can always improve a product or process without changing its characteristics, thus improvement innovations consolidate and enhance competences already acquired and present in the firm, these are changes which occur mostly during the use, indeed they result more from learning by doing activities than from *ad hoc* innovation activities. Even if they are small, their effects on the overall firm growth cannot be ignored. In order to formalise and to show the "improvement", in particular to make them recognizable by customers, firms should work on the mode to specify and put in relevance what makes the difference with the past. Incremental innovation maintains the original structure of the product or process, but they add additional elements, new technical characteristics or substitute some others. More clear is the identification of radical innovations, that indicates the creation of totally new products (Gallouj & Weinstein, 1997), the term is applied to identify innovations that replace those actually employed and substitute competences that already exist, competence-destroying (Tushman and Anderson, 1986, cited in Gallouj & Weinstein, 1997). They are more complex, they generate a discontinuity with the past, determine a sort of revolution in the actual system, they are generated from formal R&D activities and they are the basis for improvement or incremental innovations. Radical innovations can represent a competitive advantage for companies that enter the market early,

but it is not guarantee of success because radical innovation face difficulties to be accepted and they often require additional investments (Therrien, Doloreux, Chamberlin, 2011).

It is possible to identify two base dimensions that characterize radical innovation: the extent to which the product incorporates a new technology and the extent to which it fulfils key customer needs better than existing products. According to this definition, radical innovations are products that involve high novelty in both the technology and in the market dimension. Radical innovations are risky and associated with higher level of uncertainty about the outcome, in particular during the development stage it is unknown whether or not the innovation will be materialized and ready to go on the market, then, in the introduction phase, it is unknown the reaction of the market.

Alternative way to rank innovation is based on the timing of entry in the market. A useful distinction is between innovation new to the firm and innovation new to the industry: the former indicates a type of innovation that modify the internal company process or introduce a new product in the company's portfolio, but this may be already adopted by other firms in the market; the latter category is referred to more radical changes not only at firm level, but also at market level. Innovation new to the firm determines a change inside the organization, but this change is not reflected at market level, thus, in case of a product innovation new to the firm, the product is already known by customers and the company only expands its offering. Instead, innovation new to the market determines a more radical break with the past. Innovation new to the firm are not necessary "new to the market", because a service concept could already exist elsewhere. Innovation are new to the market when customers recognize a shift from the previous offering. Innovations new to the market need time to be accepted by customers, indeed these products may show lower returns at the very beginning and the need for additional adjustments.

### **3.6. Different innovation strategies and their effects on firm growth**

The adoption of these types of innovation have different impacts on the company organization and its strategy, the choice depends on the company's goals and objectives. The company ability to innovate its product is seen as "the major innovation capabilities and the most obvious way to enhance performance" (Lau et al., 2010). Successful products are very profitable and give to the company the possibility to gain market share. Product innovations can be associated to radical and proactive technological strategies, that are expected to realize high returns; process innovation prevails in industry that adopt a more defensive technological



strategy with the aim to rationalize and restructure their process. This view is supported by the literature on manufacturing, but in services it is more difficult to recognize the outcome and the introduction of a process innovation could be the first step to improve the quality of the service delivered and to arrive to design a completely new service (Cainelli, Evangelista, Savona, 2005). If the interest is to improve efficiency, the company will concentrate more on the adoption of process innovation; if the interest is to increase the market share or to improve customer loyalty, it will focus more on product innovation.

Product innovation requires a greater effort for KIBS because they have to understand not only the market requirements and the specific customers' needs, but also, they have to design their internal organization to guarantee the delivering of innovative service solutions. Thus, product innovation activities involve a change in both organizational design and service content. For process innovation, the only changes are in the internal procedures, production and delivery.

The literature recognized the positive impact of product innovation over firm performances and growth (Lau et al., 2010), firms able to create highly innovative products (radical innovation) have better performances than firm that create incremental innovation, because they provide opportunities for differentiating existing products and providing technological advance products. Innovative products may be new to the market and thus they may have new functions not already present in the market, nobody can compete with these products and the company exploit first mover advantages gaining significant market share. Even if the failure rate of new to the industry product is very high, if they succeed, they will gain higher profits.

The importance of the relation between KIBS and their clients may suggest a deeper focus on collaboration for product innovation. Previous surveys emphasized the importance of product innovation for KIBS firms (Doloreux & Shearmur, 2010; Tether & Hipp, 2002). Product innovations are more easily perceivable by customers, the innovation can be appreciated and communicated to the market, especially when it provides tangible benefits, product innovations are more observable because they are themselves the outcome. The service to deliver is more visible for client than the internal process of the company which remain unknown, thus clients can better collaborate to design the product.

Past researches investigated the extent to which external and internal sources co-operate for innovation, the results support the idea that customers are an important source of information, but, their involvement depends also by the type of innovation activity performed, in the sense that they are more important for product innovation than for process innovation (Tether & Hipp,

2002). On the other hand, even if process innovations allow for more efficiency (cost reduction and higher price premium) they remain internal to the company, are not visible externally and the benefits are perceived by the company, thus they are more difficult to communicate and to transmit to customers (Damanpour & Gopalakrishnan, 2001; Love & Mansury, 2007). KIBS and their client do not collaborate for process innovation, which remain under the responsibility of the service provider.

High innovative products are an important stimulus for growth, researchers indicate that new product introductions have a positive impact on firm performances and they surpass less innovative product.

An extensive knowledge base, associated with higher absorptive capacity of the company, can favour the introduction of radical innovation (Sorescu, Chandy, Prabhu, 2003). The literature on innovation affirms that networks are a source of knowledge because they contain information that contribute to the firm's innovative ability, thus being part of a network contribute to identify and develop innovative solutions that otherwise would not be recognized. Firms that have access to a large variety of external source are able innovators. Thus, it is reasonable to expect that companies that want to introduce new innovations first, are likely to interact with a wide variety of external actors, among these, clients are more frequently used. Instead, external sources are much less used to improve existing product or process (Amara & Landry, 2005). But, as already showed by Laursen and Salter (2006), is not only the quantity of information you acquire that increase the probability to introduce innovations new to the market (external search breadth), but also the quality of these relations (external search depth). Here the focus moves from the likelihood that external actors and information increase the develop of *successful innovations*, to the likelihood that external actors and information increase the development of *new to the industry innovation*. The advantages provided by the relation with customers suggest that companies that want to introduce products that are new to the market (innovation with high degree of novelty), rather than innovations that are only new to the firm, are more likely to collaborate with customers.

New to the industry innovations show that the company wants to enter the market early and to exploit the first mover advantages, which is defined as "the firm's ability to be better off than its competitors as a result of being first to the market" (Suarez & Lanzolla, 2005).

First mover advantage can last for a long, thus companies that succeed in building long term advantages tend to dominate their market. First mover advantages could be also of short term and even if the company cannot benefit from durable advantages, it can choose to enter the

market early. Being first mover gives technology leadership advantages, pre-emption of assets, buyer switching cost. If the company is able to sustain its advantages, these will last for a long, but being first to commercialize and produce a completely new product entails substantial investments and risk that not all the companies are willing to face, thus they may decide to “follow” through innovations only new to the firm. Innovations new to the industry can be associated to companies that decide to enter the market early and to exploit first mover advantages; while, innovation new to the firm are generally adopted by companies that show an adaptation behaviour and decide to follow the early movers.

The resource base of a company can certainly influence its choice of entrance. Lieberman and Montgomery (1988), in their studies on early mover advantages, proposed that being a pioneer is a good strategy for those companies that are skilled in new product development, while firms that have competence in marketing or manufacturing should enter later (followers), after that the initial market uncertainty, that characterized new products, is solved. In any case, companies with low innovative skills can always chose to enter the market early trying to link their resource and capabilities to those of skilled pioneers. In other words, if a company has innovative capabilities should enter the market early, otherwise it should follow and enter later, or should try to acquire and ally with pioneers.

Studies on first mover advantages have showed mixed results (Srinivasan, Lilien, Rangaswamy, 2004), new products can be early adopted in the market and accepted by customers who recognize the product's value for years ensuring that the company can maintain and increase its market share; from the other side, pioneer innovations might show negative effects on firm growth when customers delay to purchase the product because there is an initial uncertainty regarding the product utility and its features. In other words, companies may be pioneers, and thus true innovators, or imitators, when they adopt innovations already present in the industry.

The preference for one of the two strategies depends on the different propensity towards risk, different capabilities to manage the innovation process, different organizational routines for initiating and implementing changes, the behaviour of the firm population with whom the company compare its performances and activities (Massini, Lewin, Greve, 2005).

Early adopters introduce emerging technological innovation and new organizational routines facing high strategic uncertainty, they are involved in innovation activities since the early stages; followers are imitators of practice already adopted elsewhere and perceived as successful. The literature on innovation recognizes a S-shaped curve for innovation diffusion:

few firms can be considered early innovators, only when the uncertainty, that characterizes the early phases of new product or process development, is reduced and the innovation has reached certain levels of codification and standardization, then the imitators will follow (Massini et al., 2005). But, KIBS are characterized for having interactive relations with customers and the thesis already showed the benefits that can arise from collaboration with clients. Thus, it is possible to affirm that even if being first mover has some risks, these are in some way balanced and narrowed down by the co-production relation with customers.

Customers adopt “wait and see” strategy, *i.e.* they wait for someone who buy, test and express a judge about the new product. In addition, an excessive effort on the introduction of new product may generate higher development costs than revenues. Instead, once customers have already recognized the product’s value, followers and new entrants can have the advantage to avoid long waiting before commercializing the product (Srinivasan et al., 2004). First mover may generate low performances, the product should evolve before the market accept it and the company achieve the desired results. Again, it is possible to avoid this situation in KIBS because new services are co-produced with customers and so customers can provide in preventive way constructive feedback and information about the service’s required features. This allows KIBS to deliver a service which is already partially appreciated by customers, at least on a basic level.

It is widely discussed the effects of innovation and technology on growth, productivity and profitability both at macro and micro level; policy makers put attention towards appropriate action to increase the innovativeness of a region, firms invest in research and development to develop new products and services. Innovators should be able to gain market share from non innovating firms and thus growing at their expenses. Even when followers become able to replicate products of early movers, these firms should build the ability to develop new innovation in time, before past innovation reach their declining phase in the product life cycle. In this way, early adopters should grow faster.

Firms innovate to adapt their behaviour, strategy and organization to the changing environment and economic conditions in order to function effectively and achieve sustainable performances. Whatever is the innovation, if its successful introduction makes a change in the existent market conditions, then the company grow at the expenses of non-innovating firms (Cainelli et al., 2005).

Although the numerous advantages deriving from innovation, we should not forget that this is also costly. Firms need to commit big amount of resources to finance projects that are often

very risky because the success is not guaranteed. Today the economy is running very fast and thus the time lag to develop and commercialize innovative solution is reduced, the increasing competition and the born of new technologies require firms to speed up their R&D activities. The impact of innovations on growth and firm productivity has been for a long studied in respect to manufacturing firms, but now, after having understood the importance of the service sector for the whole economy, researchers are putting attention towards the implications of innovation over firm growth and performances.

Researchers support the benefits of innovation over firm performances on the basis of two main arguments:

- Organizations innovate to gain first mover advantages that allow for superior performances;
- Performance gap, which is the difference between what an organization is accomplishing and what it can potentially accomplish, requires the company to make a change in its organization to reduce this gap.

In respect to the first argument, Therrien, Doloreux and Chamberlin (2011) found that when service firms enter the market early, they gain higher commercial sales from innovation; in addition, service firms that introduce product with high novel component, even if it is already in the market, will have higher commercial sales, late followers will enjoy high commercial sales only if the product has really new and original contents, otherwise the benefits from innovation disappear. Companies that conduct innovation activities and are able to enter the market first and early increase the probability to benefits from these activities over time. In respect to the second argument, the performance gap, suggest to introduce changes when the organization reports low-performances, when there are pressures from the external environment that limit the company' ability to be successful and well performing, or when the organization recognizes the existence of new opportunities that can positively contribute to the performances (Damanpour et al., 2009).

Many studies underline the importance of innovation activities on firm's performances, but not all the innovation types affect performances in the same way, each innovation types contribute to improve certain aspects of the organization, thus their adoption depends on specific goals to achieve. At the same time, the work already showed, that internal competences and resources shape the way in which the company conducts innovation activities. Innovation matter for firm productivity but only product innovation affects firm productivity while process innovation seems to be ineffective (Musolesi & Huiban, 2009).

### **3.7. Conclusions**

Recent studies recognize that KIBS are not merely passive adopters of innovations, as the service sector has been considered for a long, but they also innovate internally. The chapter refuses the idea that innovation is only “technological” and emphasises also the importance of “non-technological innovation” and the role of “soft” sources of innovation. The synthesis approach suggests that manufacturing and services share some similarities but they do not follow identical innovation process; thus, in order to conceptualize innovation, the distinction between goods and services has been surpassed, technological and non technological dimensions are taken into account. For what concern KIBS, it is emerged that: innovation is an interactive learning process, linked to the absorptive capacity of the company; it involves relation with external actors, especially lead users. All the innovation can be classified inside to two broad categories: process and product innovation. It seems that KIBS collaborate with customers to deliver product innovation that are new to the industry. Now the work moves towards the implementation and the analysis of an empirical model to understand how service customization and clients’ collaboration influence the innovation and how they affect growth in KIBS.

## CHAPTER 4

### **The model: hypotheses, data, implementation, results**

The thesis highlighted the main features of KIBS firms, co-production relations with customers and customized services are defining elements. The relation between innovation and firm's growth showed that KIBS may adopt different types of innovations and different strategies: product and process innovations, first mover or adaptive strategies. This chapter presents an empirical model to test the effect of collaboration and customization on KIBS growth considering the type of innovation introduced. The aim is to understand the level of collaboration and customization embedded in the best performing innovation strategies. The chapter is organized as follows: section 4.1 explains what are the hypotheses of the model; section 4.2 describes the data sample and the research method; section 4.3 describes the variables included in the model and how I built them; section 4.4 shows some descriptive statistics and the implementation of the model; section 4.5 presents the results of the analysis; section 4.6 concludes.

#### **4.1. Model's hypotheses**

In the last 20 years, scholars have put attention towards the service sectors, in particular they are interested in studying the KIBS sector, which is almost considered a distinct research topic. These studies evolved during the years through different research trends using qualitative and quantitative methodologies (Muller & Doloreux, 2009). Initially, KIBS were studied mainly theoretically underlining their peculiarities and distinguishing them by other sectors (Miles et al., 1995). Then, after having recognized the importance of innovative activities in KIBS, scholars investigated empirically how they innovate and whether they innovate differently from manufacturing (Tether, 2005). These studies follow the guidelines provided by the OECD Oslo Manual, a guide developed to collect and interpret data on innovation, and the Community Innovation Survey (CIS) methodology, which collect and interpret data on innovation activities and performances of both service and manufacturing firms. Studies on innovation in KIBS have focused on patterns of innovation (Freel 2006; Leiponen, 2005; Tether & Hipp, 2002), the relation among innovation process and performances (Cainelli et al. 2005, 2004), innovation and collaboration with clients (Greer & Lei, 2012, Tether, 2002). But still, the actual findings require more empirical contributions on innovation in KIBS, in particular with regards to the

impact of KIBS features, customization and collaboration, on innovation and growth and the types of innovation strategies pursued.

The interest towards KIBS is due to the relevant role they are acquiring in the modern economy and their contribution in terms of employment and economic growth. KIBS are service firms involved in the development of innovative solutions for SMEs, they rely on professional and technological knowledge (Miles et al., 1995). KIBS are either the primary source of knowledge for their clients, but they also acquire information from their clients to design customized service through a continuous knowledge flow. Therefore, they are defined as collectors of knowledge because they gather, process and distribute knowledge spread around the environment (Castaldi, Faber, Kishna, 2013; Muller & Doloreux, 2009).

Following the open innovation paradigm, the literature on services put emphasis on the co-production relation between KIBS firms and their clients (den Hertog, 2000; Muller & Zenker, 2001; Bettencourt et al., 2002; Etgar, 2008). KIBS collaborate with clients from the initial development of the service idea to the final delivery, the interaction is aimed to design the appropriate service solution that meet client requirements, thus client collaboration has great influences over the final output. KIBS develop new services when they are moved by a client request, the knowledge exchange process may represent a moment in which the service provider can improve its internal innovating capabilities. This relation allows KIBS to exchange data, information and knowledge with clients about their needs, new market trends and product features. KIBS can scout new business opportunities and identify new services to satisfy customers' needs (Campagnolo & Cabigiosu, 2015). The literature emphasizes many positive effects from the client supplier relationships that allow the company to deliver innovative service solutions. Firms cannot develop innovations using only their internal resources, but today the innovation process involves interactions with external agents (Doloreux & Shearmur, 2010). External collaborations with customers is beneficial for service innovation and to increase the share of revenues from these innovations (Leiponen, 2005).

The thesis already showed that innovation is bidirectional, not only KIBS stimulate innovative process in clients' organizations, but they are also innovators for their own (Muller & Zenker, 2001); indeed, the vision shifted from supplier dominated firms, to co-producers and true innovators (den Hertog, 2000; Muller & Doloreux, 2009).

KIBS have been investigated with regards to "how they innovate" and "whether they innovate differently from manufacturing" (Tether, 2005); Tether and Hipp (2002) pointed out that KIBS innovate differently from other service firms. This work recognizes the existences



of some differences and similarities in innovation activities between services and manufacturing, but it does not identify two completely separate models of innovation. The four dimensional model developed by den Hertog (2008) suggests, in a simple way, how innovation may occur in services, innovation is not related only to the service itself, but it involves four main dimensions: new service concept, new interface, new delivery system, new technological options.

KIBS are incentivized to provide innovative services in response to clients' needs, organizations innovate because the pressures from the external environment, competition, customer demands and regulation, require companies to adapt and increase the service quality to achieve growth (Damanpour et al., 2009). Hence, even if KIBS firms innovate for internal purposes they cannot avoid to consider clients, either for what concerns the inputs provided in form of knowledge (client collaboration), either for what concerns clients' requirements to receive customized services (service customization).

The positive association between innovation and firm performances is widely recognized by the literature (Cainelli et al., 2005), but the identification of the most powerful innovation types in explaining firm's sales growth needs further investigations. Companies can adopt different types of innovations, the work distinguishes principally between product and process innovations. Product and process innovations have different drivers, while product innovations are mostly market driven and are introduced to meet customers need; process innovations have an internal focus, they increase internal efficiency and effectiveness. Both two, directly or indirectly make a change in the service and organization's characteristics to improve the company' performances and achieve higher growth.

Even if in services, given their immateriality and their nature, it is difficult to clearly distinguish between the two innovation types, here product innovation is referred to the service content, while process innovation is more oriented towards organizational innovation and the introduction of new technologies in the production process to improve the delivery of the service.

When innovation is driven by client's needs, KIBS and their clients collaborate mostly for product innovation (Doloreux & Shearmur, 2010). In services, product innovation is more common than process innovation (Hipp & Grupp, 2005; Doloreux & Shearmur, 2010), Tether and Hipp (2002) found that most of the high knowledge intensive service firms invest in R&D to develop new services, this suggest a strong propensity towards product innovation:

- From one side, the literature suggests the development of product innovation to achieve higher growth;
- From the other side, also the client supplier relation that occurs in KIBS, suggested the development of product innovation.

As regard the first point, it seems reasonable because product innovations have an external focus and are more visible in respect to process innovations that have an internal focus and are not visible to clients, in other words clients recognize direct benefits from product innovations, rather than indirect benefits from process innovations, which instead affect mostly the internal company production process. New products developed push customers to buy these products, because they do not care about the internal company process, or they do not even know how the service has been produced. What matters for customers are the benefits and the value recognized in the service for their organization; indeed, KIBS deliver their innovation through services, in the sense that it is not only a matter of selling a technology, in the case of T-KIBS, or performing an intellectual activity, in the case of P-KIBS, but it is a more intense support offered to clients, through which they recognized the value added embedded in the service.

About the second point, as conceptualized by the open innovation paradigm, companies should rely on different external actors and sources when they conduct innovation activities. KIBS are an example of how external actors are integrated inside the company to bring new ideas, thus the collaboration between customers and KIBS is beneficial for product development, many companies take advantages from this integration to increase their performances and to grow. Lau et al. (2007) showed a positive relation between client integration and product performances, mediated by product innovation. While client collaboration favours product innovation, this increases product performances and ultimately the company grows.

Knowledge embodied in lead users contribute to help KIBS to understand the market in general, and more specifically client's needs. Users that interact in innovative processes with KIBS may decide precisely what they want and how, increasing their satisfaction.

Client collaboration leads to more successful product development, the advantages derived from this collaboration should be used more frequently to develop products with higher degree of novelty (Nieto & Santamaria, 2007). There is a wide consensus regarding the role of users, in particular lead-users, in providing valuable inputs in the early phases of innovative projects for the development of radical innovations (Lettl et al., 2006). Lead-users are actors outside the

company and they are considered as the major source of innovation, they play the role of co-producers (Etgar, 2008, von Hippel, 2005; den Hertog, 2000).

Figure 8. Collaboration, innovation and growth

Client collaboration → Product innovation new to the industry → Firm growth

*Personal elaboration*

Radical innovations generally satisfy a need for the first time in a different way, these products may create a completely new market because the technological dimension differs significantly from the previous, but the market risk is considerably high. These products require customers' participation to avoid failures once they are in the market. Lieberman and Montgomery (1988) affirmed that companies who enter the market early are in general those that own the competences and capabilities to develop radical innovations, sad differently companies that develop radical innovations are more likely to enter the market early.

Radical innovations are riskier than improvement or incremental innovations, because they determine a break with previous products and processes and whether the market will accept them is unknown. One of the risks is about the so called "market inertia". Customers may not recognize the value of radical innovations soon, thus they may require times before they are accepted by the market. Or, in the worst case, they could be not accepted at all. But in KIBS the situation is quite different. They can rely on client collaboration to develop radical product innovation, which means that they can not only perform a sort of pre-test activities prior the launching of the service in the market, but they can also exchange considerable amounts of information with clients about market' needs and service' features. Client collaboration allows KIBS to deliver a service which meet customers' requirements, at least of one customer, the one with whom they collaborate.

First mover companies aim to build long lasting competitive advantages by introducing new products that are recognized as valuable by customers, they beat competitors and increase their market share. Early movers have more time to develop and improve the service features, they have pre-emptive access to critical asset and they build a customer base which will find difficult to switch towards the products of later entrants (Suarez & Lanzolla, 2005). Therrien et al. (2011) looked at the relationship between first mover advantages and performance in several Canadian KIBS industries and they found that new to the industry services guarantee the highest increase in sales. Innovation allows companies to follow a positive path growth, KIBS that

develop radical innovations try to exploit first mover advantages and to be market leaders, but they are risky because the success is not guaranteed (Damanpour et al., 2009).

Even if the effects of this strategy are mixed, KIBS can rely on external collaborations and networks to reinforce the first mover advantages. At the same time, clients foster innovation inside KIBS firm providing new ideas to satisfy their needs and they also favour the introduction of the innovation in the market reducing the uncertainty.

Innovations are recognized as necessary for the company growth and these are more successful when they are developed in collaboration with external actors. KIBS firms may pursue higher growth by developing new service solutions during the co-production relation with customers. In particular, collaboration with customers contributes to design new services for companies that aim to enter the market early. These companies can achieve higher sales growth exploiting first mover advantages. Thus, the first hypothesis I will test in model is:

*H1. In KIBS firms, the positive relationship between innovation and firm's growth is stronger for product innovation new to the industry.*

Client collaboration and customization are typical elements in KIBS firms (Tether et al. 2001; Bettencourt et al. 2002; Wang et al., 2010; Bettiol et al., 2012). KIBS are typically small and micro enterprises that may not have the necessary resources, both financials and humans, to deliver competitive services, the open innovation literature stressed the importance of external sources of knowledge to create new ideas. In KIBS new ideas come also from customers, they are co-producers of innovations, they are key sources of knowledge not only in the sense that they provide innovative ideas, but also because they help KIBS to design the main service features according to their needs.

In the co-production relation, customer's uniqueness influences the creation process and the final output, companies that pursue co-production strategies develop services that can closely match customers' preferences (Etgar, 2008).

A recurring topic in business is how to deliver superior value to customers in a cost efficient way ensuring customer's satisfaction (Wang et al., 2010). In KIBS, collaboration ensures that the service will meet customer's need and customization is the consequence from the co-production relation with customers. Customization helps to meet customer's needs, but the effects of these strategies on the company growth are not clear.

Figure 9. Key points on external collaboration

|                                   |   |
|-----------------------------------|---|
| <b>Open innovation literature</b> | → External collaboration as a source of new ideas is beneficial |
| <b>Literature on</b>              | → Collaboration is a distinctive features                       |
| <b>collaboration in KIBS</b>      | → Clients own part of the knowledge required                    |
|                                   | → Clients provide knowledge inputs                              |
|                                   | → Clients provide market information about their need           |
|                                   | → Clints collaboration reduce the market risk                   |
|                                   | → <b>KIBS offer customized services</b>                         |

*Personal elaboration*

When companies co-innovate with customers, an excessive focus on client reduces the possibility to replicate innovations over a wider customer base. It is true that interacting with clients is a way to develop new ideas and to match their needs, but it is also true that when the service is designed to fit with specific client's organization, it is difficult to replicate for other different customers. When companies develop fully customized services, focusing excessively on single customer, they face the challenge to replicate the innovation through more standardized services.

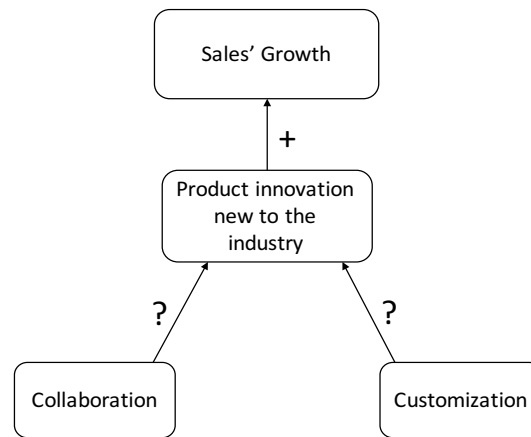
The literature on open innovation stressed the importance to rely on more external sources to extend the number of new ideas and innovative projects. But, in the case of KIBS, extending the number of collaboration with external customers requires the company to provide different customized services. Collaboration with customers has a double effect: multiple relations with customers increase the number of external source to develop innovative services, but an overemphasis on single customer blinds its positive contributions. It is clear that a similar strategy cannot be sustained by the company for a long, because it will lose operating efficiency. Laursen and Salter (2006) developed the concept of search breadth and depth, to underline that is not only the number of external collaborations that increases the innovation capability of the company (breadth), but also the quality of this relation (depth).

Thus, KIBS firms face the already mentioned trade-off between standardization and customization. There is a sort of pressure over the firm which looks at how to balance adaptation to individual customers, via more customized services, and the possibility to serve a wider customer base at once, via more standardized services (Cabigiosu et al., 2015). An excessive focus on client's need avoid to replicate innovative products and it absorbs resources without benefits on the possibility to increase the market share, while standardization ensures to spread

the costs over a larger client base. Standardization in KIBS implies to decide how much the company is willing to renounce to accommodate client needs in order to reach higher efficiency.

The choice between standardization and customization affect the way in which KIBS firm innovate and ultimately their growth.

Figure 10. How collaboration and customization affect growth?



*Personal elaboration*

Clients collaborate sharing their knowledge and helping KIBS in exploration activities but, even if some benefits from collaboration with clients are recognized, an excessive focus on clients can be unproductive. First, the literature has showed the complexity in managing the user provider relationship, companies need to invest resources and time to ensure efficient knowledge flow with their clients, otherwise it is difficult to develop successful service solutions and clients who refrain to collaborate slow down KIBS internal process. In addition, KIBS should ensure adequate knowledge flow through appropriate communication tools, in this respect investments in ICT make easier for KIBS to have access to client's knowledge. Second, collaboration with clients requires a certain degree of adaptation to their needs and the development of more customized service solution. Even if in the market there is an increasing demand for customized solution, high levels of collaboration with clients and fully customized services absorb resources without benefits on KIBS growth.

I will test the effect of customization and collaboration on firm's growth. My expectation is that when companies rely too much on client collaboration and customization, they lose the benefits from early introduced innovations and exhibit a lower growth.

**H2.** *In KIBS firms, the positive relationship between product innovation new to the industry and firm's growth is lost when full customization and the breath of collaboration with clients are both high.*

Part of the literature recognizes differences in KIBS' knowledge base, Miles (1995) distinguished KIBS in two large categories: technology base (T-KIBS) and professional services (P-KIBS) firms. Because innovation has been studied as a learning process, the company's knowledge base shape the way in which it develops new ideas, different knowledge bases imply a different approach towards innovative activities (Consoli & Elche-Hortelano, 2010; Doloreux & Shearmur, 2010; Freel, 2006; Muller & Zenker, 2001). Pina and Tether (2016) distinguished among analytical, synthetic and symbolic knowledge, they associated analytical knowledge with specialised skills related to empirical testing, rational abstraction and formalised models made of codes and organized procedures, this type of knowledge is linked to scientific and technological methods to operate, thus it seems applicable for firms that tend to rely more on formal R&D to develop their product or process and on scientific techniques like in T-KIBS. Synthetic knowledge is less formalised and more practical, it is based on a know-how built on the experiences without being particularly linked to theoretical knowledge. This type of knowledge is applied by companies that are focused on the solution of current problem through the interaction between consultant and clients, like bookkeeping, accounting, legal services and management consulting. Symbolic knowledge is diffused through symbols and imagines, this is typical of KIBS involved in advertising, communication, media and creative activities. The last two categories can be associated to professional service companies (P-KIBS). Professional KIBS innovate their services applying their experience and the knowledge which arise from the collaboration with clients, typically these are improvement or incremental innovations of existing services or processes. Pina and Tether (2016) also recognized some differences between T-KIBS and P-KIBS other than in their knowledge base:

- T-KIBS tend to be larger than P-KIBS
- T-KIBS have higher R&D propensity
- T-KIBS are more likely to introduce innovation in general, more specifically product innovation, their services are more packaged than bespoke or customized.

Tether and Hipp (2002) supported the idea to distinguish between more technical KIBS and other high knowledge intensity service firms, they observed that R&D are more important for innovation in T-KIBS in comparison to professional KIBS and they tend to spend more on ICT infrastructure, the activity of T-KIBS seems also more oriented towards product innovations. Corrocher, Cusmano and Morrison (2009) investigated the types of innovation introduced from a sample of KIBS firm in Lombardy and whether there were differences between T-KIBS and P-KIBS regarding their innovation patterns. They found that not all KIBS innovate.

The literature has for a long considered KIBS as a unique sector, instead there are probably some cross sectoral differences which suggest to apply some subcategorizations inside the whole sector.

My analysis will test the hypotheses also on the group of T-KIBS and P-KIBS identified in the sample. Through this step, I want to understand per group of firms how collaboration and customization affect growth. This final analysis aims to verify whether or not there exist substantial differences among T-KIBS and P-KIBS, indeed, according with the literature, I expect to find at least some elements that underline different behaviours, different features and different effects of customization and collaboration on growth.

## **4.2. Data and research method**

The empirical model uses data from a sample of KIBS firms located in the Veneto region (North-East of Italy). Veneto is one of the most developed Regions in Italy and in Europe in terms of both GDP per capita and employment rate; in Veneto there are many SMEs that represent in large part the client base of KIBS, in the Region there are also many local manufacturing and industrial districts such as the Belluno eyewear district, the sportswear district in Montebelluna and the furniture district in Livenza (Bettiol, De Marchi, Di Maria, Grandinetti, 2013). In the last years the regional GDP grew faster (+1,2%) in respect to the Italian average, Veneto is the third regional economy in Italy after Lombardy and Lazio. Even if it is mainly a Region where the industrial sector represents the driving force, in terms of employment and value added, in the last years it moves the productivity structure towards the so called “tertiarization”, increasing the role of the service firms and also the KIBS sector experienced a significant growth. It was due mainly to the change in the internal demand and the introduction of information technologies, these moves the service sector to weight for about two third on the regional production, the growth in the service sector has stopped only in 2008, then it moved up and down, and it stabilized in 2015 (Rapporto Statistico, 2017).

The dataset, which contains information about the dependent and independent variables, was built using two sources of information: a) the independent variables were generated from the answers collected through a survey on KIBS firms in the Veneto region; b) the dependent variable was collected consulting the AIDA database, which contains financial statements and trade descriptions of Italian companies. The independent variables cover the period 2006-2008, instead the dependent variable covers the period 2009-2011. I leave one time lag in order to mitigate the effects of past innovations on firm’s growth and to leverage the effects of the



economic crisis that occurred in that years including the period 2010-2011 during which the economy partially recovered.

The survey on KIBS firms was conducted in 2009 by a group of researchers of the Department of Economics and Management of the University of Padua for the project “Economics and Management of Knowledge Intensive Business Services and Competitiveness of Firm and Territories”, it contains data for the period 2006-2008. In 2009 Veneto accounted for about 7 thousand KIBS, a representative population sample was extracted through random selection after the analysis of two main sources: a) the Business Register held by the Italian Chambers of commerce; and b) the records of the Association of Professional Accounts to obtain data about those KIBS do not registered in the Italian Chambers of commerce. There were extracted 2,984 KIBS, these were contacted for the survey by a specialized company, which collected data through telephone interviews with KIBS founders, entrepreneur, owner or the most knowledge informant; for each company only one informant was interviewed. The survey company was *ad hoc* trained by researchers to avoid issues and to make all the questions clear, it was also assisted during the first 5% of the interviews. The questionnaire was structured to collect data also for other researches on KIBS and it contains data about: market strategies, entrepreneurship, organization, networking activities, service configuration and innovation. Questions and scales measures had been already tested in previous studies (Muller & Zenker, 2001).

The survey collected answers from 512 KIBS. I took the database containing companies' name and answers, among 512 firms I extracted only those classified as “*Società per azioni*” (*S.p.a.*) and “*Società a responsabilità limitata*” (*S.r.l.*), these account for 239 companies. This step allowed me to find financial statements on AIDA and to move to the second step.

In the second step, I collected data for the period 2009-2011 about revenues, EBITDA, value added, ROI and employment. From 239 companies only 170 had completed information about revenues for the period.

Finally, I selected KIBS firms which returned completed answers to those questions I need to build my independent variables. Among 170 Italian corporations with complete data about revenues for the period 2009-2011, only 98 returned complete answers to the survey. The intangibility of the innovative output makes difficult to measure and properly recognize the difference between product and process innovations, indeed from a sample of 170 companies that provided completed information about revenues in the period 2009-2011, I removed 72 companies because they do not provided information about the number of product or process

innovations, this measurement issue was already recognized in the literature from previous surveys (Hipp & Grupp, 2005; Tether, 2005), R&D activities, collaborations with clients and percentage of graduates. In order to apply ordinary least squares model (OLS), I verified that the dependent variable *Sales' Growth* was normally distributed, thus I performed the Shapiro–Wilk test. The null hypothesis ( $H_0$ ) of the test is that the population is normally distributed, when the p-value is higher than  $\alpha=0.05$  I can accept  $H_0$  and there is evidence that the dependent variable has a normal distribution. In the sample of 98 companies there were 4 outliers that reported higher values of Sales' growth and these affected the distribution of the dependent variables.

Table 8. Sample construction and size

|   |           |
|---|-----------|
| Number of KIBS that answered the survey   | 512       |
| Total number of <i>S.p.a</i> and <i>S.r.l</i>                                       | 239       |
| KIBS with complete information about revenues<br>(2009-2011)                        | 170       |
| KIBS that completely answered the questions to<br>compute the independent variables | 98        |
| Final sample, after outliers' deletion  | <b>94</b> |

*Personal elaboration*

Thus, I remove these outliers to respect the normal distribution assumption for the dependent variables: Shapiro-Wilk test reports a p-value of 0.067 and for values higher than  $\alpha$  I accept the null hypothesis. Finally, I came up with a sample of 94 KIBS.

### 4.3. Measures and controls

I want to test the effects of new product or process' introductions, in the industry or in the company organization, on firms' growth considering KIBS' peculiarities, product customization and collaboration with clients. Only the dependent variable was computed using data from AIDA, while the independent variables and the six controls were constructed using data from the survey.

Data for the dependent variables *Sales growth* comprise the period 2009-2011, these are measured as the percentage growth in revenues for the period. Because revenues may vary

across firms for several reason, six control variables and three dummies are included in the model.

The independent variables consider the company innovation strategy, *Product innovation new to the firm*, *Product innovation new to the industry*, *Process innovation new to the firm* and *Process innovation new to the industry*; in the survey was asked the number of innovations introduced in the period 2006-2008, by distinguishing them between product and process innovation, new to the industry and new to the firm. These are continuous variables that are measured as the number of each type of innovation introduced by the firm in the period. Patents are not considered because KIBS do not rely on formal protection mechanism. The distinction between product and process innovation is preferred by the literature to identify innovation strategies, rather than focusing only on R&D investments which play a minor role in certain service firms (Cainelli et al., 2005).

*Clients collaboration* is measured on a scale 0-4 (only integer numbers). The survey asked companies to assess in the Likert Scale (1 not important, 5 highly important) “the relevance of clients as a source of learning” in the following areas: technological research and improvement of competences, new product development, improvement in the production process, entrance in new markets or segments. I took the median level (“3” for all) of each of the four items used to assess the relevance of clients as source of collaboration, I assigned a value equal to “1” for scores higher than the median and zero otherwise. Then, I summed up the four dummies variables to obtain the overall level of relevance. I used Cronbach’s alpha coefficient to test the reliability of the construct, it reported a value of 0.82 which indicates high degree of internal consistency.

*Customization* is the percentage of services that are fully customized, the question asked companies to indicate the percentage of customized, standardized, modular and personalized services.

*Firm age* is a continuous variable. It is computed as the difference between the year of the survey (2009) and the year of the firm establishment. Firms were asked in which year they were established.

*Graduates* is the percentage of firm employees with a university degree, a master or a PhD. The literature considers KIBS as firms that on average employ high number of graduates.

*Firm size* is a continuous variable expressed by the average number of employees in the period 2006-2008. I control for this variables because size could affect the firm’s propensity or ability to innovate.

*R&D competences* is a variable in a 0-2 scale (only integer numbers) determined according to the R&D competences declared by the firm. The survey asked companies to assess on the Likert Scale (1 not at all and 5 very much) their competences as regard: the ability to recognized market opportunities before competitors and to develop services in order to capture those opportunities, the ability to collect and organize information from many sources and transfer them to colleagues. In respect to these competences, I computed two dummies variables that take the value “1” when the firm reported competences over the median, zero otherwise. Then, I summed up the two dummy variables to obtain a construct which takes value 0-2, in particular: “1” if the company has competences in only one of the two classes, “2” if the company has competences in both. I applied Cronbach alpha test to test the reliability of the construct, it reported a value of 0.65. In this case it is necessary to underline that a construct with a narrow range of items artificially deflates the coefficient.

*External collaboration* is a dummy variable equal to “1” when firm collaborate with other external actors, universities, research centers, consultants, otherwise it is “0” when firms do not collaborate.

Finally, I create two dummy variables to distinguish between *ICT* and *professional* service firms, 41 and 42 respectively, because they represent two of the three main service typology in the sample, other than design firms, 11 companies.

Table 9 shows the variable of the model, the scale and questions used to measure them.

Table 9. Variable, scale and questions

| <b>Variables</b>                               | <b>Scale</b>  | <b>Questions</b>   |
|--|---|--|
| <i>Sales growth</i>                            | Percentage  | Difference between sales in 2011 and 2009  |
| <i>Product innovations new to the firm</i>     | Count variable  | How many product innovations new to the firm did you introduce in the last three years?  |
| <i>Product innovations new to the industry</i> | Count variable  | How many product innovations new to the industry did you introduce in the last three years?  |
| <i>Process innovation new to the firm</i>      | Count variable  | How many process innovations new to the firm did you introduce in the last three years?  |
| <i>Process innovation new to the industry</i>  | Count variable  | How many process innovations new to the industry did you introduce in the last three years?  |
| <i>Clients' collaboration</i>                  | 0-4 scale.  | Use a 1 (not important) -5 (highly important) scale to assess the relevance of clients as a source of learning in the following areas:<br><ul style="list-style-type: none"> <li>- Technological research and improvement of competences;</li> <li>- New product development;</li> <li>- Improvement in the production process (inner efficiency);</li> <li>- Entrance in new markets, segments</li> </ul> |
| <i>Customization</i>                           | Percentage (0-100%).  | Which is the percentage of your services fully customized to accomplish clients' needs?  |
| <i>Firm age</i>                                | Continuous variable.  | In which year did you establish your firm?   |
| <i>Graduates</i>                               | Percentage (0-100%)   | Which is the percentage of your employees that: has a PhD, a master or a bachelor degree?  |
| <i>Firm size</i>                               | Continuous variable   | How many employees do you have?  |
| <i>R&amp;D competences</i>                     | 0-2 scale   | Use a 1 (not at all) -5 (very much) scale to assess your competences as regard:<br><ul style="list-style-type: none"> <li>- the ability to recognize market opportunities before competitors and develop services to capture such opportunities</li> <li>- collect and organize information from many sources and transfer them to colleagues</li> </ul>   |
| <i>External collaborations</i>                 | Dummy variable. This variable is equal to "1" if the answer to the question on the right was "yes", zero otherwise.                     | Do you collaborate with consultants, ICT firms, design and communication firms, engineering firms, public institutions, universities, research centers, or other firms?  |
| <i>ICT</i>                                     | Dummy variable. This variable is equal to "1" if the answer to the question on the right was "ICT", zero otherwise                      | Describe briefly the activity of your company and identify the sector.   |
| <i>Professional</i>                            | Dummy variable. This variable is equal to "1" if the answer to the question on the right was "Professional" or "Design", zero otherwise | Describe briefly the activity of your company and identify the sector.   |

#### 4.4. Descriptive statistics and regression analysis

The sample is made of 94 observations, these are young enterprises (*Firm age* reports a mean value of 11.21) with 8 employees in mean. They experienced 8.71% of sales' growth in the period 2009-2011, including the four outliers the growth rate was about 18% with a standard deviation of 57.12. The sample is almost equally divided between KIBS with a technological knowledge base (ICT) and KIBS with a professional knowledge base (Professional). KIBS tend to introduce more product innovations than process innovations, even if *Product innovation new to the industry* report higher variability (std. 10.43).

Table 10. Descriptive statistics

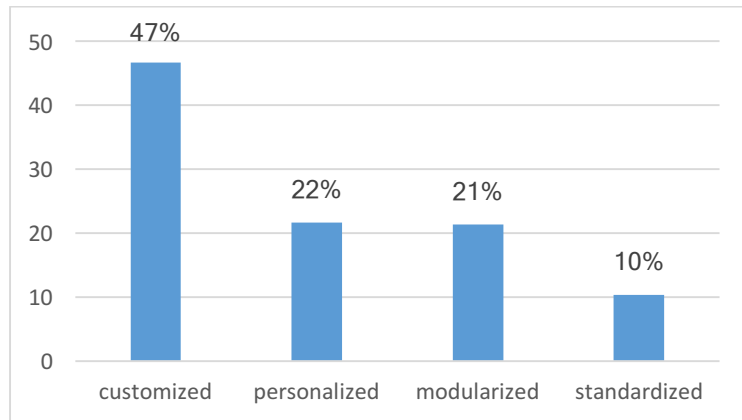
| Variables                                      | Mean      | Standard deviation | Median |
|--|-----------|--------------------|--------|
| <i>Sales' growth</i>                           | 8.71      | 33.65              | 6.61   |
| <i>Product innovations new to the firm</i>     | 1.34      | 3.74               | 0      |
| <i>Product innovations new to the industry</i> | 1.7       | 10.43              | 0      |
| <i>Process innovation new to the firm</i>      | 0.82      | 2.15               | 0      |
| <i>Process innovation new to the industry</i>  | 0.48      | 1.87               | 0      |
| <i>Clients' collaboration</i>                  | 1.38      | 1.61               | 1      |
| <i>Customization</i>                           | 46.69     | 43.39              | 50     |
| <i>Firm age</i>                                | 11.21     | 8.51               | 9      |
| <i>Graduates</i>                               | 43.36     | 33.46              | 34     |
| <i>Firm size</i>                               | 8         | 9.13               | 5.16   |
| <i>R&amp;D competences</i>                     | 0.6       | 0.69               | 0      |
| <i>External collaborations</i>                 | 0.6       | 0.49               | 1      |
| <i>ICT</i>                                     | 0.43      | 0.49               | 0      |
| <i>Professional</i>                            | 0.44      | 0.49               | 0      |
| <b>Number of observations</b>                  | <b>94</b> |                    |        |

*Personal elaboration*

About 46% of the services are customized. As showed in Figure 11, only 10% of services are on average standardized, while 22% and 21% are respectively personalized and modularized. Hence, KIBS firms do not provide only standardize and customized services, but they developed also some intermediary solutions, which account for about the 40% of the total services offered. Clearly, there are some companies who declared to provide only one typology of the above mentioned categories, but there are also companies that deliver services in a range that goes from customized to standardized. This information gives a broad suggestion about the

nature of the services in KIBS, but it does not give any indication about their impact on firm growth, my analysis will investigate more deeply the effect of customized services on KIBS' growth.

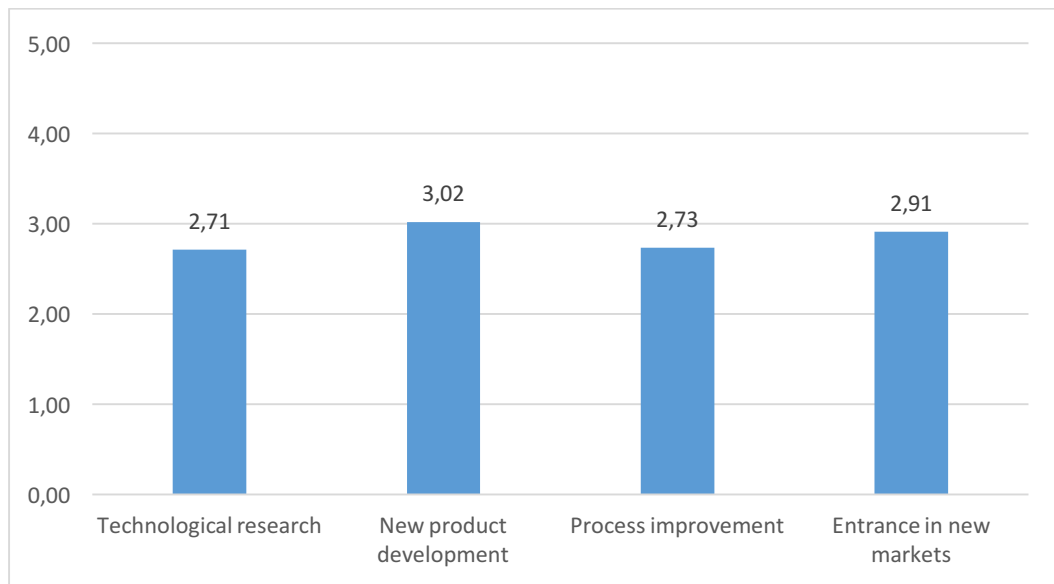
Figure 11. Percentage of services by typologies



*Personal elaboration*

The survey asked to rank in a Likert Scale (1 not important, 5 highly important) the importance of client's collaboration for technological researches, new product development, production process improvement and for the entrance in new market. The median level for each of the four areas is "3", about 60% of the companies in the sample have a low level of collaboration with clients (under the median level), this is very different from what was found in the literature. The answers provided by the sample show that there is not a prevailing area of collaboration, on average KIBS and their clients equally collaborate on all the four areas. What changes among KIBS is the level of engagements with clients: even if it is not possible to see substantial differences about the relevance of clients as source of learning in the four areas, KIBS firms do not show the same overall level of collaboration with clients, *i.e.* there are some firms that rely more on collaboration with clients (over the median level) and firms that rely less (collaboration lower than the median level).

Figure 12. Clients' collaboration areas



*Personal elaboration*

The correlation matrix in Table 11 shows the Pearson correlation coefficient for each pairs to measure the association among the variables. *Product innovation new to the firm* and *Product innovation new to the firm LowClients\_LowCustomization* are positive and significantly correlated with *Sales' growth*. Also *ICT* is correlated with *Sales' growth*, this denote the association between companies that have technological features and the growth in sales. Interesting, customization and collaboration with clients do not show any significant association with the dependent variable; *R&D competences* are associate with the increase in the level of external collaborations, this may suggest that KIBS do not rely so much on internal R&D but these activities are performed through collaborations with external actors that are different form clients: universities, research centers, consultants and other firms.



Table 11. Correlation matrix

|    | 1   | 2        | 3       | 4       | 5       | 6        | 7       | 8       | 9       | 10      | 11      | 12       | 13       | 14       | 15      | 16       | 17       | 18       |   |
|----|---|----------|---------|---------|---------|----------|---------|---------|---------|---------|---------|----------|----------|----------|---------|----------|----------|----------|---|
| 1  | Sales growth  | 1        |         |         |         |          |         |         |         |         |         |          |          |          |         |          |          |          |   |
| 2  | Process innovation new to the industry                    | -0.0191  | 1       |         |         |          |         |         |         |         |         |          |          |          |         |          |          |          |   |
| 3  | Process innovation new to the firm                        | -0.0610  | 0.7984* | 1       |         |          |         |         |         |         |         |          |          |          |         |          |          |          |   |
| 4  | Product innovation new to the industry                    | -0.0378  | 0.1464  | 0.1525  | 1       |          |         |         |         |         |         |          |          |          |         |          |          |          |   |
| 5  | Product innovation new to the firm                        | 0.1743*  | 0.4102* | 0.5591* | 0.0425  | 1        |         |         |         |         |         |          |          |          |         |          |          |          |   |
| 6  | Product innovation new to the firm_LowClients_HighCustom  | -0.0338  | 0.3817* | 0.6296* | 0.0450  | 0.3440*  | 1       |         |         |         |         |          |          |          |         |          |          |          |   |
| 7  | Product innovation new to the firm_HighClients_HighCustom | 0.0383   | 0.0084  | 0.1462  | 0.0042  | 0.1465   | -0.0484 | 1       |         |         |         |          |          |          |         |          |          |          |   |
| 8  | Product innovation new to the firm_HighClients_LowCustom  | -0.0582  | 0.6864* | 0.5835* | 0.00981 | 0.3551*  | -0.0442 | -0.0503 | 1       |         |         |          |          |          |         |          |          |          |   |
| 9  | Product innovation new to the firm_LowClients_LowCustom   | 0.2409*  | -0.0336 | 0.0396  | -0.0201 | 0.8087*  | -0.0335 | -0.0381 | -0.0347 | 1       |         |          |          |          |         |          |          |          |   |
| 10 | Firm age  | 0.0321   | 0.0130  | 0.0581  | -0.1032 | 0.0206   | 0.0956  | 0.1234  | -0.0600 | -0.0236 | 1       |          |          |          |         |          |          |          |   |
| 11 | Firm size   | 0.0321   | -0.0675 | 0.0032  | -0.0559 | -0.0060  | -0.0659 | 0.2065* | -0.0245 | -0.0174 | 0.2021* | 1        |          |          |         |          |          |          |   |
| 12 | Graduates   | -0.1257  | 0.1696  | 0.0635  | -0.0538 | -0.0806  | 0.0048  | -0.0178 | 0.0722  | -0.1283 | -0.1262 | -0.0385  | 1        |          |         |          |          |          |   |
| 13 | Customization   | -0.1524  | 0.1824* | 0.2311* | -0.0721 | 0.0225   | 0.2458* | 0.2023* | -0.0239 | -0.1309 | 0.0474  | -0.0339  | 0.3847*  | 1        |         |          |          |          |   |
| 14 | External collaborations                                   | 0.0241   | 0.1651  | 0.1694  | 0.1154  | 0.1496   | 0.1080  | 0.0557  | 0.0736  | 0.0754  | -0.0183 | -0.2669* | 0.1769*  | 0.3217*  | 1       |          |          |          |   |
| 15 | Clients' collaborations                                   | -0.0336  | 0.0940  | 0.0837  | -0.0621 | -0.0058  | -0.1689 | 0.2040* | 0.2976* | -0.1250 | -0.0060 | 0.0224   | 0.1292   | -0.0067  | 0.1787* | 1        |          |          |   |
| 16 | R&D competences   | -0.0260  | -0.0490 | -0.0238 | 0.0522  | 0.0315   | -0.0578 | -0.112  | 0.1025  | 0.0437  | -0.1080 | 0.2428*  | 0.0090   | -0.0851  | 0.0138  | 0.2619*  | 1        |          |   |
| 17 | ITC   | 0.2450*  | -0.0468 | -0.0801 | -0.0947 | 0.1384   | -0.1385 | 0.1880* | 0.0763  | 0.1435  | 0.0539  | 0.2110*  | -0.2319* | -0.2904* | -0.1257 | 0.2713*  | 0.2227*  | 1        |   |
| 18 | Professional  | -0.1987* | -0.0294 | -0.0683 | 0.1083  | -0.1855* | -0.1282 | -0.1585 | -0.0257 | -0.1050 | -0.0958 | -0.1553  | 0.2596*  | 0.1477   | 0.0671  | -0.2144* | -0.2324* | -0.7905* | 1 |

\*p ≤ 0.1

Personal elaboration

I run a multiple linear regression model (ordinary least squares), with confidence interval 95% and robust standard error, to test my hypotheses. The results of the model are showed in Table 12. The first hypothesis aims to test which type of innovation, product or process, is more influential on the dependent variable *Sales growth* in respect to the time of entry, new to the industry for KIBS that want to exploit first mover advantages or new to the firm for KIBS that use an adaptive strategy.

In columns (0) I tested whether only the control variables and the three dummy variables were significantly correlated with the dependent variables: none of the variables and the goodness of fit were significant ( $\text{Prob}>F = 0.545$ ).

To test *H.1*. I regressed the four innovation types, *Product innovation new to the firm*, *Product innovation new to the industry*, *Process innovation new to the firm* and *Process innovation new to the industry*, the control variables, *Clients' collaboration*, *Customization*, *Firm age*, *Graduates*, *Firm size*, *R&D competences*, and the three dummies variables, *External collaboration*, *ICT and Professional*, against the variable *Sales Growth*.

The variable *Process innovation new to the firm* is statistically significant at 95%, but it is negatively correlate with the dependent variable. Only *Product innovation new to the firm* developed in the period 2006-2008 positively affect growth in the period 2009-2011, the coefficient is statistically significant at 99%. Thus, *H.1*. is partially confirmed because I expected that KIBS that introduced product innovation new to the industry were those companies that experienced higher growth in terms of sales. Product innovations have positive effects on firm's growth, but only when they are "new to the firm" and not when they are introduced for the first time in the market. No other variables were statistically significant when I tested *H.1.*; the model reported a  $R^2$  of 0.13 and  $\text{Prob}>F$  equal to 0.00.

After having identified the type of innovation that positively affect growth, I wanted to determine the level of customization and collaboration with client embed in new to the firm services provided. Thus, I decided to create four variables that account for lower or higher levels of service customization and client' collaboration when KIBS develop new to the firm products.

First of all, I created four dummies variables to identify those observations that reported levels of service customization and collaboration with clients over and under the median: low customization and low collaboration take the value 1 when KIBS have lower than the median service customization and clients' collaboration, high customization and high clients' collaboration take the value 1 when KIBS reported values higher than the median. *Clients'*

*collaboration* was measured in a 0-4 scale and the median level is “1”, *Customization* is measured as the “percentage of services that are fully customized” and it has a median value of 60%. Then, I multiplied each of the four dummies for the variable *Product innovation new to the firm* and I got the following: *Product innovations new to the firm HighClients\_HighCustomization*, *Product innovations new to the firm HighClients\_LowCustomization*, *Product innovations new to the firm LowClients\_HighCustomization*, *Product innovations new to the firm LowClients\_LowCustomization*.

In order to test *H.2.*, I regressed the independent variables *Process innovation new to the firm*, *Process innovation new to the industry*, *Product innovations new to the firm HighClients\_HighCustomization*, *Product innovations new to the firm HighClients\_LowCustomization*, *Product innovations new to the firm LowClients\_HighCustomization*, *Product innovations new to the firm LowClients\_LowCustomization*, the control variables, *Clients' collaboration*, *Customization*, *Firm age*, *Graduates*, *Firm size*, *R&D competences*, and the three dummies variables, *External collaboration*, *ICT and Professional*, against the dependent variable *Sales' Growth*.

Only *Product innovations new to the firm LowClients\_LowCustomization* is positive and significantly correlated with the dependent variable ( $p\text{-value} < 0.01$ ). The model accepts *H.2.*, only *Product innovations new to the firm LowClients\_LowCustomization* is positive and significantly correlated with the dependent variable. Thus, only KIBS that in the period 2006-2008 developed product innovations new to the firm with lower than the median collaboration and customization achieve higher level of sales' growth in the period 2009-2011. The model to test *H.2.* has a  $R^2$  equal to 0.138, while the  $p\text{-value}$  of the F test is statistically significant ( $\text{Prob} > F = 0.00$ )

Table 12. Linear regression model (robust standard errors in parentheses)

| VARIABLES   | (0)<br>Sales growth | (1)<br>Sales growth | (2)<br>Sales growth | (3)<br>Sales growth |
|---|---------------------|---------------------|---------------------|---------------------|
| <i>Process innovations new to the firm</i>  |                     | -3.931**<br>(1.685) | -2.981<br>(1.954)   | -3.031<br>(1.964)   |
| <i>Process innovations new to the industry</i>  |                     | 1.969<br>(2.628)    | 3.359<br>(2.269)    | 3.339<br>(2.298)    |
| <i>Product innovations new to the industry</i>  |                     | -0.068<br>(0.128)   | -0.081<br>(0.138)   | -0.074<br>(0.138)   |
| <i>Product innovations new to the firm</i>  |                     | 2.028***<br>(0.580) |                     |                     |
| <i>Product innovations new to the firm HighClients<br/>collaboration_LowCustomization</i>   |                     |                     | -1.326<br>(3.409)   | -1.300<br>(3.392)   |
| <i>Product innovations new to the firm LowClients<br/>collaboration_HighCustomization</i>   |                     |                     | 1.116<br>(2.578)    | 1.143<br>(2.593)    |
| <i>Product innovations new to the firm HighClients<br/>collaboration_HighCustomization</i>  |                     |                     | 1.745<br>(2.927)    | 1.591<br>(2.920)    |
| <i>Product innovations new to the firm LowClients<br/>collaboration_LowCustomization</i>    |                     |                     | 2.118***<br>(0.546) |                     |
| <i>Product innovations new to the firm LowClients<br/>collaboration(0)_LowCustomization</i> |                     |                     |                     | 2.224***<br>(0.462) |
| <i>Product innovations new to the firm LowClients<br/>collaboration(1)_LowCustomization</i> |                     |                     |                     | -1.760<br>(8.459)   |
| <i>Clients' collaboration</i>   | -2.190<br>(2.335)   | -1.526<br>(2.305)   | -0.940<br>(2.660)   | -0.934<br>(2.690)   |
| <i>Customization</i>  | -0.090<br>(0.092)   | -0.073<br>(0.100)   | -0.082<br>(0.107)   | -0.083<br>(0.108)   |
| <i>Firm age</i>   | 0.029<br>(0.358)    | 0.041<br>(0.364)    | 0.018<br>(0.374)    | 0.040<br>(0.381)    |
| <i>Graduates</i>  | -0.235<br>(0.119)   | -0.029<br>(0.125)   | -0.034<br>(0.126)   | -0.029<br>(0.128)   |
| <i>Firm size</i>  | 0.091<br>(0.267)    | 0.146<br>(0.262)    | 0.126<br>(0.287)    | 0.112<br>(0.288)    |
| <i>R&amp;D competences</i>  | -3.661<br>(6.317)   | -3.872<br>(6.352)   | -3.310<br>(6.873)   | -3.822<br>(6.902)   |
| <i>External collaborations</i>  | 8.505<br>(7.785)    | 6.959<br>(8.132)    | 6.385<br>(8.299)    | 5.987<br>(8.448)    |
| <i>ICT</i>  | 15.747<br>(12.408)  | 10.974<br>(13.342)  | 12.157<br>(14.646)  | 12.762<br>(14.648)  |
| <i>Professional</i>   | -2.336<br>(12.327)  | -3.540<br>(13.610)  | -2.037<br>(15.340)  | -2.290<br>(15.479)  |
| <i>Constant</i>   | 7.184<br>(14.711)   | 8.464<br>(15.889)   | 7.501<br>(17.063)   | 7.907<br>(17.219)   |
| Observations  | 94                  | 94                  | 94                  | 94                  |
| R-squared   | 0.094               | 0.130               | 0.138               | 0.142               |
| Prob>F  | 0.545               | 0.00                | 0.00                | 0.00                |

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

To better understand the level of service customization and to what extent KIBS collaborate with clients, as reported in Table 13, I divided the sample in 4 groups classified as follow:

- In Group A there are 23 KIBS firms that reported levels of customized services higher than the median, but collaboration with clients lower than the median;
- In Group B there are 16 KIBS firms with high level of both service customization and clients' collaboration;
- Group C accounts for 21 KIBS firms, they have low level of service customization but high level of collaboration with clients;
- Group D include 34 KIBS that declared to have low level of both service customization and clients' collaboration.

From the test for *H.2.*, it appears that only companies in Group D experienced higher level of sales' growth.

Table 13. Levels of clients' collaboration and service customization per groups of firms

| Group A<br>Low Clients Collaboration High Customization, n=23 |      |      | Group B<br>High Clients Collaboration High Customization, n=16 |      |       |
|---|------|------|--|------|-------|
|   | Mean | s.d. |  | Mean | s.d.  |
| Customized  | 95.8 | 8.87 | Customized   | 90   | 11.18 |
| Standardized  | 0    | 0    | Standardized   | 4.38 | 9.98  |
| Personalized  | 3.04 | 8.22 | Personalized   | 1.88 | 5.27  |
| Modular   | 1.09 | 4.25 | Modular  | 3.75 | 7.81  |
| Clients collaboration   | 0.26 | 0.45 | Clients collaboration  | 3    | 0.87  |

| Group D<br>Low Clients Collaboration Low Customization, n=34 |       |       | Group C<br>High Clients Collaboration Low Customization, n=21 |       |       |
|--|-------|-------|---|-------|-------|
|  | Mean  | s.d.  |   | Mean  | s.d.  |
| Customized   | 13.68 | 21.37 | Customized  | 13.29 | 22.55 |
| Standardized   | 18.09 | 35.21 | Standardized  | 13.81 | 30.53 |
| Personalized   | 29.71 | 40.93 | Personalized  | 43.95 | 44.84 |
| Modular  | 38.53 | 35.21 | Modular   | 28.95 | 42.26 |
| Clients collaboration  | 0.15  | 0.36  | Clients collaboration   | 3.38  | 0.86  |

Personal elaboration

Because only the variable *Product innovations new to the firm LowClients\_LowCustomization* showed a positive and significant correlation with the dependent variable, the analysis moved on to better understand the dynamics inside Group D.

In Group D there are companies that answered to collaborate with clients only in one area or that do not collaborate with clients at all, thus I decided to study which of these two subgroups achieved higher performances in terms of sales growth. I created two dummies variables for companies that reported lower than the median levels of collaboration with clients, in particular: *Low\_Clients(0)* when KIBS do not collaborate with clients in any areas, *Low\_Clients(1)* when KIBS collaborate in only 1 area. Finally, I multiplied the latter dummy variables for the variable *Product innovations new to the firm LowClients\_LowCustomization*, so I got:

- *Product innovations new to the firm LowClients(0)\_LowCustomization*, which identified KIBS that do not consider clients as a relevant source of knowledge in any area;
- *Product innovations new to the firm LowClients(1)\_LowCustomization*, when KIBS consider collaboration with clients as relevant only in 1 area.

When I run the model with these additional new independent variables *Product innovations new to the firm LowClients(0)\_LowCustomization*, and *Product innovations new to the firm LowClients(1)\_LowCustomization*, only *Product innovations new to the firm LowClients(0)\_LowCustomization* is positive and statistically significant. R-squared is 0.142 and Prob>F equal to 0.00.

Finally, I decided to apply the same analysis separately for the group of T-KIBS and P-KIBS in order to investigate whether there exist some remarkable differences. I will provide descriptive statistics of the two group and a linear regression analysis to assess the impact of collaboration and customization on firms' growth. The two correlation matrixes for T-KIBS (Table 16) and P-KIBS (Table 17) are provided in Appendix.

I divided my sample size between firms that in the survey identified their activity as ICT and those that identified their activity as professional or design. Among 98 KIBS, including outliers, I classified 42 companies as T-KIBS and 56 companies as P-KIBS. In order to work with OLS, I performed the Shapiro-Wilk test for the two subsample to verify if the dependent variable *Sales growth* was normally distributed. The Shapiro-Wilk test confirmed the presence of outliers in the two subsample. Thus, I removed 1 outlier from the T-KIBS subsample and 2 outliers from the P-KIBS subsample. After outliers deletion, the Shapiro-Wilk test was respectively 0.17 and 0.075 and I came up with a sample of 41 T-KIBS and 54 P-KIBS.

Table 14 provides the descriptive statistics for the two subsamples, stars indicate when the t-test shows a significant difference between the mean values.

I run a t-test on a sample of 41 T-KIBS and on a sample of 54 P-KIBS to determine if there were statistically significant mean differences, the results of the t-test for the sample mean highlights some differences between the two group:

- T-KIBS experienced a significantly higher growth in sales in the period 2009-2011
- T-KIBS show a higher propensity towards collaboration with clients, but P-KIBS tend to provide more customized services than T-KIBS
- P-KIBS employ more graduates
- T-KIBS are significantly bigger than P-KIBS
- R&D competences are significantly higher in T-KIBS

Table 14. Descriptive statistics T-KIBS and P-KIBS (stars when values are statistically different)

| Variables                                      | T-KIBS  |                    | P-KIBS   |                    |
|--|---------|--------------------|----------|--------------------|
|  | Mean    | Standard deviation | Mean     | Standard deviation |
| <i>Sales' growth</i>                           | 18.04** | 31.25              | 3.49     | 36.66              |
| <i>Product innovations new to the firm</i>     | 1.92    | 4.96               | 0.87     | 2.35               |
| <i>Product innovations new to the industry</i> | 0.58    | 1.82               | 2.51     | 13.66              |
| <i>Process innovation new to the firm</i>      | 0.63    | 1.86               | 0.96     | 2.34               |
| <i>Process innovation new to the industry</i>  | 0.39    | 1.73               | 0.55     | 1.96               |
| <i>Clients' collaboration</i>                  | 1.87*** | 1.59               | 1        | 1.51               |
| <i>Customization</i>                           | 32.43   | 39.75              | 58.22*** | 42.96              |
| <i>Firm age</i>                                | 11.73   | 8.78               | 10.64    | 8.37               |
| <i>Graduates</i>                               | 34.58   | 29.92              | 51.07**  | 35.07              |
| <i>Firm size</i>                               | 10.18** | 12.66              | 6.24     | 4.39               |
| <i>R&amp;D competences</i>                     | 0.78**  | 0.68               | 0.46     | 0.66               |
| <i>External collaborations</i>                 | 0.53    | 0.50               | 0.64     | 0.48               |
| Observations                                   | 41      |                    | 54       |                    |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Personal elaboration*

The linear regression model for T-KIBS and P-KIBS follows the same procedural steps as explained above. Only the model for T-KIBS showed significant correlation between the dependent and the independent variables. I provide the table with the linear regression model for P-KIBS (Table 18) in the Appendix. Table 15 shows the linear regression model for T-KIBS, with robust standard errors in parentheses.

When I run OLS to test *H.1.*, only *Product innovation new to the firm* was positive and statistically significant (p-value < 0.001). Also *Firm size* shows a positive and significant correlation with *Sales growth* at 90%, this suggests that size matters for the growth in companies with a technological knowledge base. Instead, *Process innovation new to the firm* is statistically significant at 90% level but is negatively correlated with the dependent variable, suggesting that the introduction of new process do not positively affect the growth in sales but it maintain an internal focus and thus it should be studied in relation to performances' indicators of internal efficiency.

*H.1.* was partially confirmed and I moved forward my analysis to test *H.2.*, in particular I wanted to understand the effects of customization and collaboration with clients on the growth of T-KIBS. *Product innovation new to the firm LowClients\_LowCustomization* is positive and statistically significant at 99%. The regression model accepts *H.2.* and again the best performing firms are those with the lower levels of both service customization and clients' collaboration. When I run the model to test *H.2.*, firm size continues to be positive and statistically significant (p-value <0.05) for the dependent variable.

Finally, among the T-KIBS with lower than the median level of clients' collaboration, I distinguished between KIBS that do not collaborate at all with clients (*Product innovation new to the firm LowClients(0)\_LowCustomization*) and those that collaborate in at least 1 area (*Product innovation new to the firm LowClients(1)\_LowCustomization*). Product innovation has positive effects on *Sales' growth* only when KIBS avoid any types of collaboration with clients. Interesting, for companies that develop technological services the variable *R&D competences* is not significant for the growth in sales.



Table 15. Linear regression model for T-KIBS (robust standard errors in parentheses)

| VARIABLES  | (0)<br>Sales growth | (1)<br>Sales growth | (2)<br>Sales growth | (3)<br>Sales growth |
|--|---------------------|---------------------|---------------------|---------------------|
| <i>Process innovations new to the firm</i>   |                     | -7.064*<br>(3.804)  | -5.123<br>(4.217)   | -5.579<br>(4.236)   |
| <i>Process innovations new to the industry</i>   |                     | 8.95<br>(5.433)     | 7.908<br>(5.629)    | 8.011<br>(5.813)    |
| <i>Product innovations new to the industry</i>   |                     | -0.136<br>(5.758)   | 1.736<br>(4.747)    | 1.977<br>(4.865)    |
| <i>Product innovations new to the firm</i>   |                     | 2.396***<br>(0.727) |                     |                     |
| <i>Product innovation new to the firm HighClients collaboration_LowCustomization</i>   |                     |                     | -0.744<br>(3.928)   | -0.699<br>(3.827)   |
| <i>Product innovations new to the firm LowClients collaboration_HighCustomization</i>  |                     |                     | 2.344<br>(14.959)   | -1.024<br>(14.655)  |
| <i>Product innovations new to the firm HighClients collaboration_HighCustomization</i> |                     |                     | -2.398<br>(4.537)   | -2.589<br>(4.569)   |
| <i>Product innovation new to the firm LowClients collaboration_LowCustomization</i>    |                     |                     | 2.488***<br>(0.757) |                     |
| <i>Product innovation new to the firm LowClients collaboration(0)_LowCustomization</i> |                     |                     |                     | 2.634***<br>(0.692) |
| <i>Product innovation new to the firm LowClients collaboration(1)_LowCustomization</i> |                     |                     |                     | -1.233<br>(8.957)   |
| <i>Clients' collaboration</i>  | 0.602<br>(2.581)    | 1.535<br>(2.384)    | 2.756<br>(2.845)    | 2.619<br>(2.797)    |
| <i>Customization</i>   | -0.031<br>(0.155)   | -0.027<br>(0.165)   | -0.001<br>(0.218)   | -0.012<br>(0.22)    |
| <i>Firm age</i>  | -0.698<br>(0.457)   | -0.507<br>(0.5)     | -0.482<br>(0.545)   | -0.463<br>(0.578)   |
| <i>Graduates</i>   | -0.151<br>(0.156)   | -0.174<br>(0.159)   | -0.212<br>(0.207)   | -0.19<br>(0.203)    |
| <i>Firm size</i>   | 0.561*<br>(0.307)   | 0.682*<br>(0.336)   | 0.755**<br>(0.338)  | 0.759**<br>(0.346)  |
| <i>R&amp;D competences</i>   | -10.814<br>(10.236) | -12.103<br>(9.66)   | -14.085<br>(11.128) | -15.721<br>(10.763) |
| <i>External collaborations</i>   | 18.823<br>(11.393)  | 12.088<br>(12.235)  | 11.952<br>(15.947)  | 10.631<br>(16.476)  |
| <i>Constant</i>  | 24.001<br>(11.35)   | 20.482*<br>(11.31)  | 20.484<br>(12.402)  | 22.77**<br>(10.839) |
| Observations   | 41                  | 41                  | 41                  | 41                  |
| R-squared  | 0.1477              | 0.3029              | 0.3205              | 0.3293              |
| F  | 0.1678              | 0.00                | 0.00                | 0.00                |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 4.5. Results

The results of the model partially confirmed the initial hypotheses. First, in line with the literature, only product innovation affects firm growth, but in contrast with *H.1.*, the variable is positive and significant only when KIBS introduce innovations that are already present in the industry. Instead, *Process innovation new to the firm* is significant but negatively correlated with the dependent variable. The model for *H.2.* investigated how different combined levels of service customization and clients' collaboration in new to the firm product affect *Sales growth*. High levels of customization and collaboration are not statistically significant, instead only KIBS that reported levels of service customization and clients' collaboration lower than the median achieved higher growth in sales. Hence, the model confirms the idea behind *H.2.*: an excessive focus on clients is detrimental for the firm growth. This hypothesis received additional support when I distinguished inside the variable *Product innovation new to the firm LowClients\_LowCustomization*, KIBS that do not collaborate at all with clients (0) and KIBS that do collaborate in only one area (1). Interesting, only the variable *Product innovation new to the firm LowClients(0)\_LowCustomization* is positive and statistically significant.

This certainly suggest to rethink the co-production relation between KIBS and their clients, high levels of service customization and clients' collaboration do not influence the growth in sales, but it does not mean that firms avoid to adapt their services to clients' needs. Indeed, even if KIBS reported low levels of service customization, they do not renounce to adapt their service to clients' needs through modular and personalized services. Table 13 gives two relevant insights:

- first, it allowed me to identify lower and higher levels of clients' collaboration and service customization;
- second, it returned more detailed information about the group of the best performing KIBS (Group D), here I observed that even if companies develop services with lower than the median level customization, they do not renounce to provide more standardized forms of services, like modularized and personalized services.

In general, it is possible to affirm that the best performing KIBS firms in the sample do not rely on clients as critical source of knowledge. This confirms the hypothesis according to which an excessive collaboration with clients risks to be resources consuming and do not provide additional advantages.

The literature identified differences in the knowledge base of KIBS, thus I decide to divide the sample of 94 KIBS in two subsamples: those with a technological knowledge base (T-KIBS)

and those with a professional knowledge base (P-KIBS). A linear regression model was implemented for both subsamples, but only the model for T-KIBS gave significant results. However, the comparison of the descriptive statistics for the two groups shows some clear differences: T-KIBS have grown more in sales in the period 2009-2011 and are bigger in size, they collaborate more with clients but they tend to customize less their services and to employ a lower share of graduates.

The linear regression model for T-KIBS confirmed the results already provided for the whole sample of 94 KIBS: product innovation new to the firm is positive and significantly correlated with sales' growth, but only when companies reported a level lower than the median for both service customization and collaboration with clients they experienced higher growth. Additionally, the model for T-KIBS shows a positive and significant correlation of *Firm size* with the dependent variable, suggesting that being a bigger T-KIBS is beneficial for the growth in sales.

The literature underlined the importance of R&D for high-technology intensive service firms, T-KIBS declared to have on average higher R&D competences in respect to P-KIBS, but the variable is not statically significant for the growth in sales.

#### **4.6. Conclusions**

After having analysed the literature on KIBS in the previous three chapters, here I elaborated some hypotheses to better understand the dynamics inside the KIBS sector. In particular, I studied the effects of clients' collaboration and service customization when KIBS develop new product or process to achieve higher growth in sales. I developed an empirical model to test the effect of product and process innovation, clients' collaboration and service customization on the dependent variable sales growth. Findings partially confirmed my hypotheses: product innovations have positive and significant effect on sales growth, but only when they are new to the firm; KIBS that put lower emphasis on service customization and clients' collaboration achieved higher growth in terms of sales. An excessive focus on client do not provide much advantages for the firm's growth. Following Miles' classification (1995) and other contributions about KIBS' knowledge base, I decided to test the same assumptions considering the two subsamples T-KIBS and P-KIBS. The empirical model provided useful information only for the former sample, while for the latter, it did not provide significant results. In T-KIBS I observed mostly the same dynamics already tested for the comprehensive sample, in addition I can only underline the positive and significant effects of *Firm size* on the dependent variable.

These findings contribute to provide some implication for entrepreneurs who manage KIBS firms and for the literature, indeed the relation between KIBS' features and their performances need further investigations, considering either the characteristics of different innovation types, either the different knowledge base of KIBS.

## CHAPTER 5

### Theoretical and Managerial implications

The previous chapter was dedicated to the implementation of an empirical model to test the impact of collaboration with client and service customization on firm's growth. Results partially confirmed the hypotheses. In a sector where traditional R&D activities are less used and firms are small, the role of clients as co-producers of innovative service solutions seems to be central. But the empirical model showed some interesting results about the extent to which collaboration with clients and service customization affect growth in KIBS. This last chapter represents the conclusion of the work and it is organized as follow: section 5.1 aims to discuss the results of the analysis and to provide theoretical and managerial implication; section 5.2 highlights the limitations of the model and suggestions for future researches; section 5.3 concludes.

#### 5.1. Discussing results

Companies seek to develop innovative solution to improve their performances and to grow. Innovation has always been identified as fundamental element for firms that want to grow their business and survive in competitive markets. Innovative product or process improve the company's performances, but choosing the right innovation strategy is an issue. Not all the strategies are beneficial for the growth of the business and firms should implement the best solutions considering their business, their features and the external environment. Contemporary innovation theories support the idea to foster and improve the success of the innovation process through collaborations with external actors. In these regards, an interesting case is that of KIBS firms where the co-production relation with customers is presented by the literature as a way to develop new ideas and services, but it has some counter-intuitive implications.

I distinguished between innovation types, product and process, new to the firm and new to the industry, and I observed the combinative effects of the adoption of innovation types on firms' growth, considering KIBS features, customization and clients' collaboration. In order to survive and to grow, firms introduced new product or process for existing or new customers, but past researchers found that the impact of innovations on KIBS performances depends on the composition of innovation types, in the sense that firm's performances are affected not only by the introduction of a single type of innovation, but from the multiple adoption of different innovations. The empirical model developed on a sample of KIBS firms showed that the

introduction of services, already present in the industry but new for the firm, have positive effects on the growth in sales. On the contrary, it seems that the introduction of new to the firm processes are not beneficial for the growth in sales. The first consideration is about the effects of product and process innovations on firms' growth. Product innovations are services offered to clients, they are more visible, they have an external focus, they are market driven and the output results in a differentiated service from those of competitors. Customers require innovative services and innovation occurs as a change in the service content, customers acquire services that meet their needs and otherwise would not be satisfied, in other words, customers acquire services to solve internal problems that otherwise would not be solved through their own core competences. Process innovations have an internal focus, they aim to increase the internal efficiency of KIBS and to facilitate internal activities, like service production and delivering. New processes involve different mechanism to satisfy existing or new needs: new delivery process, new organizational configurations, new marketing strategies, new production method. Sometimes they require changes that customers may not be willing to accept. When new innovations do not reflect an increase in sales, once they are introduced in the market, this denotes that customers refused to accept the innovation because it does not fit with their needs. New process could be beneficial only for the organization that develop them, *i.e.* for KIBS firms, while customers may not recognize any significant difference in the service content. Product and process innovations have different objectives: the former aims to increase sales, the latter to increase the internal efficiency and ultimately the sales. But the point is that, even if both types of innovations provide advantages for KIBS, both innovation do not provide the same advantages for customers. Thus, the effects of process innovation on sales growth probably disappear. Companies can implement different strategies to achieve profitability and to grow, there is not a unique best way but different solutions are associated with different objectives and performances' measurements. KIBS can choose between process and product innovations, but if they want to achieve a higher increase in sales, maybe a deeper focus on product innovation seems more convenient. This does not want to reduce the role and the effects of process innovation, but it wants to advise that, probably, different considerations are on the base of the adoption of product and process innovations.

The empirical estimations suggest that only those products that are already present in the industry but still not developed by the company, have a positive and significant effect on sales growth during the years. Firms that enter the market later focus more on improving the quality

of the services or they make internal improvements in the process, thus they try to improve customers' satisfaction and the internal efficiency; the variable *Sales growth* is clearly affected by the improvements in existing products because customers recognized higher quality in the new services provided and reward the company acquiring these services, while incremental process innovation are more difficult to be recognized by customers or they are not accepted at all, thus they have a negative effect on the growth in sales.

Firm in the sample are mainly small and micro enterprises, it seems they have adopted a defensive tactic (late adopters) instead of more aggressive strategies, like first mover. This maybe suggests that KIBS in Veneto concentrated their efforts in maintaining their market share, instead of trying to increase it. We should consider that KIBS in the sample are on average small enterprises (about 8 employees in mean), thus it could be difficult to exploit first mover advantages even when they can rely on clients' collaboration. Being first mover requires firms to invest substantial resources to transfer the value of new developed product to customers; in addition, a great effort to develop radical innovations and to market them it is not sufficient when clients refuse to buy the new services. Again, I underline that the services are acquired by customers to satisfy some specific needs, thus if they do not have any particular problem to solve or needs to satisfy, they will not acquire completely new services and KIBS should be better on providing already existing services (imitating).

While early entrance companies pursue a more aggressive strategy to gain competitive advantages and market share faster than competitors, late adopters are companies that decide to follow the incumbent and to adapt their strategy by imitating the best practices already consolidated in the industry. KIBS that introduced "*product innovations new to the firm*" did not risk to enter the market offering completely new services, but they built a strategy based on some consolidated and already accepted practices, probably the firm' dimension represent a constraint, small companies were not willing to sustain all the risk that a first mover strategy implies. By imitating and following early entrance, KIBS can offer services that allow them to maintain the market share and survive in the market.

The literature on first mover highlighted the advantages to be a pioneer in the market, companies that enter the market first and build long lasting competitive advantages achieve higher performances. But, the literature itself recognizes that first mover strategies show mixed results and sometimes they are not beneficial at all. My empirical model suggests that when KIBS tried to enter the market early, introducing services completely new for the industry, these did not achieve a significant positive increase in sales. Instead, KIBS that grown more, in terms

of sales, were those that introduced new products already present in the industry (new to the firm); hence, it seems that KIBS that decide to introduce “*product innovation new to the firm*” gained more in terms of revenues at the expenses of those that enter the market early. Again, first mover advantages show mixed results. Certainly there are some pioneer innovations that have been introduced in the market, otherwise none can follow; thus, there are certainly some companies that introduce new products in the industry (and the answers provided in the survey confirm it), but these strategies were not effective on sales’ growth, indeed the model shows that new to the industry innovations have not significant impact on sales’ growth, nor positive or negative. In order to advance the technological developments, in *lato sensu*, certain companies should work on the introduction of completely radical innovations, but these strategies should be combined with more adaptive (follower) strategies. What appears is that in the KIBS sector the benefits of first mover strategies are lost. In the KIBS sector it is difficult to maintain first mover advantages for a long. The service life cycle is short and companies that do not continually innovate will lose the advantages acquired initially. KIBS do not typically rely on formal protection mechanism when they develop innovative services, thus the possibility to replicate and to adopt innovations developed elsewhere is higher. This contributes to make the service life cycle shorter and the implementation of first mover strategies riskier. New to the industry services erode their positive effects quickly and KIBS cannot exploit first mover advantages. As consequence, it is easier for KIBS either being imitated, and thus losing the first mover advantages, or being followers and avoiding the costs in which the incumbent incurred. A common perception, especially in the occidental society, is that being an imitator gives a bad imagine of the company or the person. Instead, there exist companies that own the competences to reproduce and improve ideas developed elsewhere. These companies should exploit this capability to survive and succeed in the markets. Imitating alone is probably not sufficient to increase sales and it is properly what gives a bad image of the company. Imitating should always be associated with incremental or improvement innovations: every times companies try to imitate their competitors, they should try also to added additional features to the product or service to achieve a minimum differentiation from competitors.

This is almost what emerges from the model. From one side some KIBS were more able to exploit their capabilities of imitators and decided “to follow” early entrance competitors; from the other side, pioneer companies found difficulties in maintaining their first mover advantages due to the characteristics of the sector, the service features, the external context. The advice here is to balance the introduction of radical innovations with the adoption of innovations



developed elsewhere, in order to ensure the company's growth without constraining the overall innovation propensity that characterized the KIBS sector. I do not want to push managers in KIBS firms to avoid the pursuing of radical innovation, because this could have ultimately a negative effect on the entire economic system: KIBS that refuse to develop radical innovation for SMEs, lose their importance in the economy as "valid support for the growth of SMEs" slowing the economic growth of the region. Therefore, the fear to start risky innovation activities should not stop innovation process in KIBS, but they should also exploit the ability to imitate successful innovation already introduced in the industry. Recalling the famous BCG matrix, the development of radical product innovation might be financed with the share of revenues gained by imitating already introduced services. Of course, when one company succeed in providing radical new services, it will exploit the first mover advantages, probably it will grow considerably as market leader and the others can follow again.

Even the co-production relation with customers, seems to be not beneficial when companies want to exploit first mover advantages in challenging contexts, as that in which KIBS operate. Clients' collaboration is a defining feature of KIBS, clients provide knowledge input that KIBS apply when they design the service solution. The open innovation theory suggests companies to put more emphasis on building a network of external collaboration, following this line, the literature on KIBS has given importance to the co-production relation between KIBS and their customers. More emphasis on collaboration with external actors should allow KIBS to acquire new ideas and to design a service that better meet customers' needs.

This works aims to clarify some aspects of this relation. The empirical estimations show that only companies that rely less on clients achieve higher performances in terms of sales' growth. It seems that an excessive focus on clients do not provide significant advantages, instead a lower level of collaboration is significant for the company's growth. These findings do not want certainly undervalue or reject the past contributions of the literature, but they want signal some important aspects that may be less visible and clear. The relation with clients is hard to manage, the third chapter pointed out some issues that KIBS firms face when they collaborate with external users underlining the complexity of the relation. What matters for KIBS is the quality of the information received by customers and not only the quantity, only relevant information are so powerful to positively influence the innovation process; indeed, too many external collaborations do not provide advantages if the quality of the inputs received is poor. In other words, not all the clients are able to transfer valuable knowledge inputs to KIBS firms in order

to stimulate their innovation processes. The inputs provided by clients may stimulate innovative ideas when clients are particularly skilled and knowledgeable, but when clients do not transfer significant information to KIBS, then the co-production relation does not generate significant advantages. After having understood this point, the dilemma remains where do qualitative information come from? Customers are sources of information, but probably not all customers are providers of qualitative information.

The quality of the interaction may be poor because or clients do not put effort in the relation or because they do not have valuable knowledge inputs to transfer. In the first case, KIBS can always implement some performances enhancing tools to improve customers' participation if they consider customers as a valuable source of knowledge. In the second case, things are more complicated when clients are not the right knowledgeable partners. Clients are knowledgeable not only when they have technical skills, but also when they are able to recognized emerging needs. If innovative ideas came from clients, only the more knowledgeable clients can provide substantial contribution to the KIBS growth and stimulate their innovation process. When KIBS decide to innovate, a selection of clients seems to be necessary because not all the relation and external actors stimulate the development of innovative products or process. When the knowledge flow between KIBS and their clients is qualitative poor, this does not stimulate innovations and, as consequences, the new services introduced in the market are not sufficiently "innovative" or "attractive" for customers.

When clients are small or they miss the complexity and the knowledge to stimulate innovations in KIBS firms, being first mover is more difficult. Some SMEs expect a more proactive behaviour from KIBS in delivering the service, in particular they expect that the service provider will be able to deliver a service without significant contribution from the user. When this happens, clients are not co-innovators and their contribution is not relevant to spot new market trends. The literature gave emphasis to the numerous benefits that derive from the user-provider relation, but maybe these are lost when clients are not knowledgeable contributors. The regression showed that only companies that collaborate with clients in a few areas reach higher growth in sales. Even if this seems counter intuitive, it might support the idea that higher number of collaborations is not necessary beneficial for the growth of KIBS; instead, also lower number of collaboration might be relevant when these are of superior quality. Maybe, there is a deeper connection in the results of the regression analysis, being a follower and having less collaborative relations with clients. We could expect that when collaboration with clients is poor, new ideas do not flow into KIBS' organization and they

cannot develop completely radical innovations to enter the market first. KIBS that want to introduce innovations in their organization should select the right partner that can stimulate innovative ideas, but this is certainly one of the bigger issues. This partially contrasts with the literature on KIBS firms, which stressed the importance of strong interaction with clients along the innovation value chain; clients do not provide substantial contributions during the development and exploitation phases when they are not skilled or knowledgeable enough, unfortunately, it is easy to happen because clients decide to rely on KIBS and externalize those activities that are not in their core competences. The advice for managers is to better consider the quality of the relations and the clients' capabilities to stimulates innovative ideas.

Clients are a valuable asset in KIBS because they provide knowledge about new market trends and unsatisfied needs. Hence, ideas come mostly from clients, but maybe non all the clients are really a source of innovative ideas. Clients' needs can be past, actual or future; past and actual needs are well known by clients and they are easily perceivable, while future needs are more difficult to recognized and are less perceivable or clear. The quality of the knowledge provided by clients is also a matter of suggesting future trends that other companies are not able to recognize, *i.e.* a client is more valuable when he looks forward and provides knowledge about future needs not already recognized in the market. This additional intuition might explain, in a different way, why new to the firm innovations have more effect on KIBS' growth than new to the industry innovations. Only when clients provide knowledge about future needs, KIBS can introduce new to the industry innovation; indeed, this type of information allows KIBS to develop radical innovations to enter the market first. Instead, when clients provide knowledge and information about past and actual trends, KIBS develop innovations new to the firm but already present in the market. Again, the possibility for KIBS to enter the market early depends on the client ability to co-innovate with the service provider transferring knowledge of advance quality, in this case about future needs not already recognized by KIBS' competitors. Here, we return again to the choice of the best partner. Not all the clients are able to spot and suggest ideas about future needs, many KIBS provide services to SMEs which could lack internally the experience, the knowledge and the ability to recognized new and unsatisfied needs. Only a few clients in KIBS portfolio might provide the necessary knowledge inputs for the development of radical innovations, indeed it could happen that most of them, because their small size, do not have the competences and the resource to collaborate with KIBS in non-core activities. When clients can look forward and anticipate a need that will become diffuse in the industry, then KIBS get superior knowledge and the possibility to develop radical innovations.

Collaboration with clients has numerous advantages and disadvantages for KIBS that decide to innovate, because they can reduce the risks to introduce new services in the market and they can better understand customers' needs. But, when KIBS collaborate with their clients, they also tend to develop more customized form of services; indeed, the service's features are shaped by the client's knowledge inputs and needs. Too much collaboration with client limits the possibility to replicate the innovation; when KIBS develop a customized service for one client, then it is not certain that this solution can be applied in other provider-user relations. Hence, KIBS face the challenge to balance the development of a service adapted to client' needs, with the possibility to replicate the same service also for other clients. Full customized services limit the possibility to replicate the same innovation for other clients, consequently innovation reduces its effects on firm's growth.

The analysis concentrated also on the customized nature of services. After having analysed the literature and KIBS' characteristics, I could expect to find a significant impact of customized services on sales, instead the empirical model confirms the hypothesis according to which an excessive focus on clients' needs is not beneficial for the firm's growth because it reduce the possibility to replicate the services among a greater client base. Clients' needs are heterogeneous and both goods and services aim to provide personalized experiences to each client. This does not occur only in business-to-customer (B2C) industries but also in business-to-business (B2B) industries, as in KIBS. They provide services to solve specific problems of SMEs, these companies do not own all the resource and competences internally, thus they rely on KIBS firms to satisfy their needs. Different companies have different needs and KIBS are required to adapt their services to specific customers' needs. The literature on KIBS emphasised the customized nature of the services provided, not only because customers have heterogeneous needs but also as consequence of the co-production relation between service provider and lead user. When customers provide knowledge inputs for the development of innovative services, they shape the service's features according with their needs. What happens is that KIBS are involved in the co-innovation of customized service solutions to solve specific clients' problem. At this point two lines run parallel: from one side innovation activities are presented as mechanism to improve the company' performances; but from the other side, KIBS develop customized services that are difficult to replicate. The empirical analysis shows that high customized services do not provide significant advantages when KIBS want to increase their sales. The more KIBS are driven by clients' requirements, the more this dependence will be in contrast with the possibility to exploit and diffuse innovative services among several clients.

Fully customized services seem to be not beneficial for the firm's growth because they limit the possibility to replicate innovative solutions on a wider client's base. Assuming that KIBS have solved the first problem to find the right partner (lead user) with whom they co-produce innovative services, once the partner provides knowledge inputs, he wants to receive in exchange customized service that best fit with his needs. When KIBS firms cannot exploit the innovation developed on a wider customer base, this relation remains successful in its own. The risk to provide highly customized services, even if very innovative, is that these may not fit with different needs of different customers. Hence, KIBS face the problem to contemporary satisfy specific customer through more customized form of services and to extend their market share through replication of the innovation developed. KIBS should balance the trade-off between customization and standardization. A deeper analysis of the group of companies that provide customized service lower than the median level shows that these companies offer mainly personalized (standard services with a minimum adaptation) and modular services. The best performing companies (Group D) are able to balance adaptation to customers' need with a certain level of standardization. It seems that these companies are choosing to follow a mass customization strategy, through which they are able to satisfy heterogeneous needs ensuring replicability. Mass customization allow KIBS to provide services that are designed to meet individual customers' need, but these are produced through more flexible procedures that allow KIBS to reach a certain level of replication. The company develops standard modules that can be assembled to meet customers' unique orders and, at the same time, ensure replication and cost advantages. KIBS mix these modules into different combination that best fit with customer preferences and the company can satisfy different needs in a cost efficient way. Replication is mainly achieved in the procedures, while the service content is adapted to meet different needs.

The aim of this work is not to go inside of a deep analysis about modularized, personalized, customized and standardized service, but it wants to go further the classical idea that KIBS provide mainly customized services. The work wants to underline that also customization seems to be detrimental for the firm's growth. Indeed, the best performing KIBS firms provide also modular and personalized services. I want to worry managers that adaptation to customers' needs should be balanced with some forms of service standardization. Here the advice is not to rely much on single clients, but companies that aim to increase their market share and to grow in sales, should seriously consider how to exploit innovations on a wider base. New inventions become an innovation only when the company can spread its benefits in the market, otherwise if it remains confined inside the single KIBS-user relation, it does not provide additional

stimulus to the company growth and, on the contrary, it consumed resource because the investments made are not realized through the increase in sales.

Finally, I also tested the effects of customization and collaboration with clients separately for two different groups of KIBS: those with a technological knowledge base and those with a professional knowledge base. This additional analysis aims to point out the existences of two group of KIBS differentiated in respect to their knowledge base. Further theoretical researches should consider this differentiation, knowledge embodied in employees and in the organization is the primary production factor, this influences the innovation process which has been seen as a learning process. Different managerial implication could be drawn for T-KIBS and P-KIBS, thus the literature should better understand whether there exist significant differences. My analysis was meaningful only for T-KIBS, because the model for P-KIBS did not provide significant results. In T-KIBS, I observed the same dynamics showed for the comprehensive model. Now, I cannot provide differentiated managerial implication for the two group, but I can only highlight the existences of quite significant differences which might imply also different managerial implications to reach in future studies.

## **5.2. Limitations and future researches**

This study wants to give also some theoretical contribution to the literature. The economy is moving towards an increasing importance of the service sector and knowledge inputs, intangible features are becoming relevant in goods, while services are becoming more tangible. The literature on innovation requires to reconsidering this distinction in studying innovation in goods and service. The empirical estimations regressed a set of explanatory variables against the dependent variable *Sales' growth*, even if I used some control variables, there could be additional elements that are not under control and might influence the growth in sales.

The analysis could be performed using different performances' measures not only to reduce possible estimation errors due to uncontrolled factors, but also to better highlights the impact of different innovation types. I observed the combinative effects of process and product innovation, but they have different focus and different objectives. In this regards, two different performances' measures should be adopted: for product innovation, given their external focus, an indicator as the growth in sales that measures the success of the innovation in the market seems appropriate; instead, for process innovations it could be better to apply a measure of internal efficiency and profitability. I do not want say that my choice of the dependent variable

was uncorrected, but since the literature has stressed the importance to observe the contemporary impact of different innovation types on firm' performances, my analysis confirms that different innovation types have different objectives and thus they might require appropriate performances' indicators that capture the overall impact of innovation types on the organization.

Time measurement issues could also affect the analysis, I am measuring the effects of three years of innovations over the subsequent three years of revenues growth. Maybe the short period considered does not catch the effects of certain innovation types. Future investigation should try to understand whether or not there are innovation types that have significant effects on the long run growth and what are these effects. A longitudinal study is recommended to get additional insights about the effects of innovative products or processes on KIBS' performances. It is reasonable to expect that the model implemented in this thesis does not capture the long run effect of innovation types and maybe, among these, there are the radical innovations.

The thesis highlighted the importance to work with clients who can provide significant contribution to the innovation process of KIBS firms. My empirical estimations do not consider the characteristics of the clients with whom KIBS in the sample interact, but future research may investigate when clients stimulate successful ideas and the characteristics of the clients with whom KIBS interact in order to investigate when successful interactions are realized. This quantitative analysis is not able to go deeper inside the clients' characteristics and the relation between KIBS and their client, thus future researches should investigate both empirically or through case studies comparison, how this interaction can produce positive benefits.

Future research should also concentrate on larger sample to increase the reliability of the results and to catch additional unrecognized effects.

In this work I did try to minimize the literature' contribution on service customization in KIBS, but I wanted to highlight that customization is not always the best strategy for firms that aims to increase their market share and there exist several other successful solutions that need additional investigations, some of them already implemented by the companies.

When I built my dataset using data from AIDA, I noticed that many KIBS firms went in bankruptcy or they had a procedure in course, this did not have impact on the sample selection because I took only active companies, but it could be interesting to understand what were the causes of these failures and which type of strategy they implemented. Thus, future researches should observe also the other side of the coin, understanding why KIBS fail.

Finally, service providers are distinguished in technical and professional, these two extremes show that maybe it is not sufficient to generalized the same implications for the entire KIBS sector, but there are evident differences in the knowledge base of the companies that probably generate different dynamics and innovation trajectories.

### **5.3. Conclusions**

The empirical model challenged two commonly recognized features of KIBS firms: service customization and clients' collaboration. From a managerial point of view, the success and the growth of KIBS firms depend on how entrepreneurs, considering their priority and target objectives, leverage the relations between: product and process innovation, first mover and adaptive strategies, clients' collaborations, customization and standardization. From a theoretical point of view I advanced the literature on innovation in services, the impact of clients' collaboration and service customization on KIBS growth. Services innovations are difficult to measure and researchers should adopt the right performances measure for different innovation types. In order to measure innovation, the distinction between goods and services should be surpassed, because goods are acquiring intangible features and services are becoming more tangible. First mover strategies have mixed effects and they should be analysed carefully case by case, adaptive and imitating strategies do not assume a secondary role. Longitudinal investigations should try to understand the effects of innovation on the long run growth. The co-production relation with customers does not provide significant increasing in sales' growth when clients lack of knowledge, thus the relation with customers, in particular with lead users, should be studied considering the quality of the information exchanged and the contribution that different clients can provide. KIBS do not develop only customized services, but they use other intermediary solutions to foster the growth in sales. The main issues that remain open is how to recognized and select the right partner for KIBS. This might open the discussion for future research, understanding who are the right partners, how to scout and start a relation with them, what kinds of mechanisms improve the success of the partnership between service provider and users. Finally, future investigations should consider the distinction in the knowledge base of KIBS.



## **Appendix**

The appendix provides: the correlation matrix for T-KIBS and P-KIBS, the linear regression model for the P-KIBS sample.

Table 16. Correlation matrix T-KIBS

|    | 1   | 2       | 3       | 4       | 5       | 6       | 7       | 8        | 9       | 10      | 11      | 12       | 13      | 14       | 15      | 16     |   |
|----|---|---------|---------|---------|---------|---------|---------|----------|---------|---------|---------|----------|---------|----------|---------|--------|---|
| 1  | Sales growth  | 1       |         |         |         |         |         |          |         |         |         |          |         |          |         |        |   |
| 2  | Process innovation new to the industry                    | 0.2315  | 1       |         |         |         |         |          |         |         |         |          |         |          |         |        |   |
| 3  | Process innovation new to the firm                        | 0.1693  | 0.8189* | 1       |         |         |         |          |         |         |         |          |         |          |         |        |   |
| 4  | Product innovation new to the industry                    | 0.2129  | 0.9209* | 0.8689* | 1       |         |         |          |         |         |         |          |         |          |         |        |   |
| 5  | Product innovation new to the firm                        | 0.3627* | 0.2332  | 0.4148* | 0.2606* | 1       |         |          |         |         |         |          |         |          |         |        |   |
| 6  | Product innovation new to the firm_LowClients_HighCustom  | -0.1140 | -0.0071 | -0.0349 | -0.0299 | -0.0114 | 1       |          |         |         |         |          |         |          |         |        |   |
| 7  | Product innovation new to the firm_HighClients_HighCustom | 0.0336  | 0.0500  | 0.2957* | 0.2873* | 0.1431  | -0.0662 | 1        |         |         |         |          |         |          |         |        |   |
| 8  | Product innovation new to the firm_HighClients_LowCustom  | 0.1256  | 0.7717* | 0.7332* | 0.7005* | 0.2683* | -0.0580 | -0.0836  | 1       |         |         |          |         |          |         |        |   |
| 9  | Product innovation new to the firm_LowClients_LowCustom   | 0.3339* | -0.0500 | 0.0942  | -0.0536 | 0.9142* | -0.0469 | -0.0676  | -0.0592 | 1       |         |          |         |          |         |        |   |
| 10 | Firm age  | -0.1248 | -0.1754 | -0.0427 | -0.0102 | -0.0119 | -0.0510 | 0.1898   | -0.0704 | -0.0310 | 1       |          |         |          |         |        |   |
| 11 | Firm size   | 0.0141  | -0.1282 | 0.0002  | 0.0077  | -0.0416 | -0.0584 | 0.1897   | -0.0701 | -0.0617 | 0.2496  | 1        |         |          |         |        |   |
| 12 | Graduates   | -0.1238 | 0.2688* | 0.1292  | 0.2283  | -0.1196 | 0.3293* | -0.0410  | 0.1055  | -0.1776 | 0.0678  | -0.0389  | 1       |          |         |        |   |
| 13 | Customization   | 0.0802  | 0.2475  | 0.2043  | 0.3339* | 0.0105  | 0.2960* | 0.3952*  | 0.0050  | -0.1343 | -0.0825 | 0.0291   | 0.4222* | 1        |         |        |   |
| 14 | External collaborations                                   | 0.2267  | 0.1836  | 0.0808  | 0.1927  | 0.1656  | -0.2306 | 0.0806   | 0.0516  | 0.1511  | -0.0231 | -0.2664* | 0.2269  | 0.2944*  | 1       |        |   |
| 15 | Clients' collaborations                                   | -0.0275 | 0.1802  | 0.1771  | 0.1958  | -0.1081 | -0.1643 | 0.1672   | 0.2553  | -0.2369 | 0.0794  | -0.0523  | 0.2658* | 0.0087   | 0.1140  | 1      |   |
| 16 | R&D competences   | -0.1554 | -0.0521 | -0.1027 | -0.0937 | -0.0340 | -0.0358 | -0.3539* | 0.0454  | 0.0399  | -0.1089 | 0.3617*  | 0.0694  | -0.2900* | -0.0841 | 0.1111 | 1 |

\*p ≤ 0.1

Personal elaboration

Table 17. Correlation matrix P-KIBS

|   | 1        | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10       | 11       | 12      | 13      | 14      | 15      | 16 |
|---|----------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|---------|---------|---------|---------|----|
| 1 Sales growth  | 1        |         |         |         |         |         |         |         |         |          |          |         |         |         |         |    |
| 2 Process innovation new to the industry                    | -0.1582  | 1       |         |         |         |         |         |         |         |          |          |         |         |         |         |    |
| 3 Process innovation new to the firm                        | -0.1706  | 0.7888* | 1       |         |         |         |         |         |         |          |          |         |         |         |         |    |
| 4 Product innovation new to the industry                    | -0.0465  | 0.0999  | 0.1100  | 1       |         |         |         |         |         |          |          |         |         |         |         |    |
| 5 Product innovation new to the firm                        | -0.1529  | 0.7809* | 0.9411* | 0.0642  | 1       |         |         |         |         |          |          |         |         |         |         |    |
| 6 Product innovation new to the firm_LowClients_HighCustom  | -0.0005  | 0.4845* | 0.7750* | 0.0344  | 0.7862* | 1       |         |         |         |          |          |         |         |         |         |    |
| 7 Product innovation new to the firm_HighClients_HighCustom | -0.1699  | -0.0691 | 0.0039  | -0.0451 | 0.0135  | -0.0605 | 1       |         |         |          |          |         |         |         |         |    |
| 8 Product innovation new to the firm_HighClients_LowCustom  | -0.2487* | 0.6470* | 0.5142* | 0.0697  | 0.5419* | -0.0404 | -0.0393 | 1       |         |          |          |         |         |         |         |    |
| 9 Product innovation new to the firm_LowClients_LowCustom   | 0.0479   | 0.0319  | -0.0125 | -0.0031 | 0.1402  | -0.0557 | -0.0542 | -0.0363 | 1       |          |          |         |         |         |         |    |
| 10 Firm age   | 0.0582   | 0.1540  | 0.1376  | -0.1289 | 0.0646  | 0.1539  | -0.0579 | -0.0550 | -0.1163 | 1        |          |         |         |         |         |    |
| 11 Firm size  | -0.1451  | 0.0504  | 0.0753  | -0.0990 | -0.0067 | -0.0762 | 0.0237  | 0.0283  | 0.1761  | 0.1575   | 1        |         |         |         |         |    |
| 12 Graduates  | 0.0392   | 0.0929  | -0.0080 | -0.1214 | 0.0234  | -0.0794 | 0.2833* | 0.0790  | 0.0703  | -0.2672* | 0.0824   | 1       |         |         |         |    |
| 13 Customization  | -0.1454  | 0.1290  | 0.2203  | -0.1681 | 0.1876  | 0.2413* | 0.1811  | -0.0097 | -0.1132 | 0.1618   | 0.0307   | 0.3019* | 1       |         |         |    |
| 14 External collaborations                                  | -0.1370  | 0.1503  | 0.2218  | 0.1256  | 0.2083  | 0.1636  | 0.1787  | 0.1195  | -0.0694 | 0.0248   | -0.2623* | 0.0629  | 0.2835* | 1       |         |    |
| 15 Clients' collaborations                                  | -0.1527  | 0.0632  | 0.0689  | -0.0728 | 0.0528  | -0.1658 | 0.3227* | 0.3238* | -0.1488 | -0.1054  | -0.0151  | 0.1617  | 0.1294  | 0.3096* | 1       |    |
| 16 R&D competences  | -0.0696  | -0.0272 | 0.0596  | 0.1143  | 0.0631  | -0.0297 | 0.4432* | 0.1323  | -0.1572 | -0.1193  | -0.0604  | 0.0406  | 0.1641  | 0.1646  | 0.2993* | 1  |

\*p ≤ 0.1

Personal elaboration

Table 18. Linear regression model for P-KIBS (robust standard errors in parentheses)

| VARIABLES   | (0)<br>Sales growth | (1)<br>Sales growth | (2)<br>Sales growth | (3)<br>Sales growth |
|---|---------------------|---------------------|---------------------|---------------------|
| <i>Process innovation new to the firm</i>   |                     | 0.700<br>(3.341)    | 0.997<br>(3.825)    | 0.997<br>(3.825)    |
| <i>Process innovation new to the industry</i>   |                     | -2.960<br>(2.835)   | -0.693<br>(2.298)   | -0.693<br>(2.298)   |
| <i>Product innovation new to the industry</i>   |                     | -0.090<br>(0.179)   | -0.118<br>(0.170)   | -0.118<br>(0.170)   |
| <i>Product innovation new to the firm</i>   |                     | -0.419<br>(3.280)   |                     |                     |
| <i>Product innovation new to the firm HighClients collaboration_LowCustomization</i>    |                     |                     | -7.355<br>(5.440)   | -7.355<br>(5.440)   |
| <i>Product innovation new to the firm LowClients collaboration_HighCustomization</i>    |                     |                     | -0.093<br>(3.777)   | -0.093<br>(3.777)   |
| <i>Product innovation new to the firm HighClients collaboration_HighCustomization</i>   |                     |                     | -38.850<br>(27.416) | -38.850<br>(27.416) |
| <i>Product innovation new to the firm LowClients collaboration_LowCustomization</i>     |                     |                     | 4.288<br>(4.165)    |                     |
| <i>Product innovation new to the firm LowClients collaboration (0)_LowCustomization</i> |                     |                     |                     | 4.288<br>(4.165)    |
| <i>Product innovation new to the firm LowClients collaboration (1)_LowCustomization</i> |                     |                     |                     | -                   |
| <i>Clients collaboration</i>  | -2.639<br>(3.816)   | -2.665<br>(3.839)   | 0.315<br>(5.138)    | 0.315<br>(5.138)    |
| <i>Customization</i>  | -0.144<br>(0.124)   | -0.148<br>(0.137)   | -0.175<br>(0.132)   | -0.175<br>(0.132)   |
| <i>Firm age</i>   | 0.696<br>(0.584)    | 0.782<br>(0.683)    | 0.791<br>(0.624)    | 0.791<br>(0.624)    |
| <i>Graduates</i>  | 0.183<br>(0.178)    | 0.201<br>(0.202)    | 0.263<br>(0.200)    | 0.263<br>(0.200)    |
| <i>Firm size</i>  | -1.787<br>(1.186)   | -1.760<br>(1.306)   | -1.759<br>(1.411)   | -1.759<br>(1.411)   |
| <i>R&amp;D competences</i>  | 0.595<br>(7.881)    | 0.448<br>(8.350)    | 7.169<br>(9.078)    | 7.169<br>(9.078)    |
| <i>External collaborations</i>  | -9.752<br>(12.905)  | -7.834<br>(14.143)  | -7.674<br>(14.348)  | -7.674<br>(14.348)  |
| Constant  | 14.929<br>(18.002)  | 13.613<br>(19.979)  | 7.277<br>(19.916)   | 7.277<br>(19.916)   |
| Observations  | 54                  | 54                  | 54                  | 54                  |
| Prob>F  | 0.3766              | 0.5706              | 0.00                | 0.00                |
| R-squared   | 0.105               | 0.127               | 0.194               | 0.194               |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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